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ABSTRACT

This instructional package is intended for use in training Air Force personnel enrolled in a program for apprentice carpenters. Training includes an introduction to carpentry and provides instruction in the use of carpentry hand, portable power, and shop tools; construction and maintenance of wood structures; installation of building hardware; and erection of prefabricated buildings. Military training is also provided for end-of-course appointments, predeparture safety briefing, and physical conditioning. The package contains a set of lesson plans, five study guides, and five workbooks. Included in each lesson plan are a course content outline, lists of pertinent student instructional materials, approximate times to complete each phase of the course, suggested teaching methods, and instructional guidance. The study guides consist of series of instructional units, each of which contains an objective, an introduction, instructional text, and questions. Numerous figures and diagrams illustrate the text. The accompanying workbooks include objectives, lists of needed equipment, instructions for performing various tasks, and written exercises. A list of directed study assignments is also included. (MN)

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CARPENTRY SPECIALIST

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SHEPPARD TECHNICAL TRAINING COMMAND

CE044075

POI J3ABR55230 000
(PDS Code NDZ)

PLAN OF INSTRUCTION
(Technical Training)

CARPENTRY SPECIALIST

SHEPPARD TECHNICAL TRAINING CENTER

10 April 1986 - Effective 14 July 86 with Class 860714

ATC Form 214 JAN 86 PREVIOUS EDITIONS ARE OBSOLETE. STANDARD COVERSHEET

LIST OF CURRENT PAGES

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DEPARTMENT OF THE AIR FORCE
USAF Technical Training School (ATC)
Sheppard Air Force Base, Texas 76311

PLAN OF INSTRUCTION J3ABR55230 000
(PDS Code NDZ)
10 April 1986

FOREWARD

1. PURPOSE: This publication is the plan of instruction (POI) when the pages listed on Page A are bound into a single volume. When separated into units of instruction, it becomes the Lesson Plan/Part I. The POI contains the qualitative requirements for course J3ABR55230, Carpentry Specialist, in terms of objectives for each unit of instruction and shows planned time, training standard correlation, and support materials and guidance. This POI was developed according to ATCR 52-18, Plans of Instruction, Lesson Plans and Course Validation.

2. COURSE DESIGN/DESCRIPTION: The instructional design for this course is Group/Lock Step. The course trains airmen to perform duties prescribed in AFR 39-1 for Apprentice Carpenter, AFSC 55230. Training includes an introduction to carpentry and provides instruction on carpentry hand, portable power, and shop tools; construction and maintenance of wood structures; installation of building hardware; and erection of prefabricated buildings. Deviation from the sequence of the subject matter in this plan of instruction is authorized when it is necessary to minimize the detrimental effects of adverse weather, inoperative equipment, or other factors of temporary duration which could otherwise degrade training. In addition, military training is provided for end of course appointments, pre-departure safety briefing, and physical conditioning.

3. REFERENCES: This POI is based on Specialty Training Standard, 552X0, December 1978, and Course Chart J3ABR55230 000, 1 October 1982.

William W. Miller
WILLIAM W. MILLER, Colonel, USAF
Commander, 3770 Tech Tng Gp

Supersedes Plans of Instruction J3ABR55230 000, 30 December 1982
OPR: 3770 Technical Training Group
Prepared by: Mr. Michael Young
Distribution: Listed on Page A

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE Carpentry Specialist

BLOCK TITLE

Introduction to Carpentry

1. COURSE CONTENT	2. TIME
1. Orientation and Course Introduction	1.5/0 Day 1 (1.5/0)

a. Welcome

b. Overview of course content and goals

c. Inform students of benefits of the Community College of the Air Force (CCAF) and its assignment of academic credit for training at regional accredited institutions.

d. Student progress policies to include:

(1) Progress checks

(2) Written tests

(3) Special individual assistance

e. Student recognition program

f. Effective study procedures

g. Ground safety

h. Procedures for shelter exercises and fire evacuation plan

i. Student critique program

j. Energy conservation

k. Emphasize fraud, waste, and abuse program

l. Types, use and care of training literature

m. Instructions for completion of STTC Form 120, Processing Checklist-TDY Student Personnel

n. Professional Conduct and Relationships ATCR 30-4

SUPERVISOR APPROVAL OF LESSON PLAN

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SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials

SG J3ABR55230 000-I-1, Orientation and Course Introduction
SW Power Production Division/All Courses, The Air Force Fraud, Waste and Abuse Program
DS J3ABR55230 000, Directed Study Assignments

Training Methods

Lecture (1.5 hrs)

Instructional Guidance

Welcome students. Explain the schools chain of command. Identify locations of exits and fire extinguishers. Conduct student tour of course facilities. The following references are used in preparing this lesson: AFR 123-2, Air Force Fraud, Waste and Abuse (FW&A) Prevention and Detection; ATCR 52-3, Student Measurement; ATCR 52-26, Student Scheduling and Administration; and ATCR 52-29. Student Critique Program. Explain DS time and DS Assignment Sheet. Hand out SW FW&A.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Introduction to Carpentry

1. COURSE CONTENT	2. TIME

2. Technical Publications 2.5/0 Day 1

a. Given AFR 0-2, locate standard publication numbers and titles in numerical index. Seven of ten responses must be correct. STS: 3a MEAS: PC (1/0)

(1) Format of AFR 0-2

(2) Use of AFR 0-2

b. Given commercial publications and a list of carpentry tools and equipment, locate desired information in the commercial publication. Eleven of fifteen responses must be correct. STS: 3b MEAS: PC (.5/0)

(1) Format of commercial publications

(2) Use of commercial publications

c. Given AFR 85-1, AFM 85-4, and AFP 85-1, locate desired information in the publications. Five of the seven responses must be correct. STS: 3c MEAS: PC (1/0)

(1) Types of AF publications

(2) Use of AF publications

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-I-2 Technical Publications
WB J3ABR55230 000-I-2 Technical Publications
Publication File
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Methods
Lecture/Discussion (1 hr)
Performance (1.5 hr)

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Instructional Guidance

Familiarize the students with the publications. Explain the purpose and use of AFR 0-2, Air Force Standard Publications, and commerical pulbications. Progress Check 2a, 2b and 2c will be administered following each applicable presentation. Each student will be evaluated on the objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Introduction to Carpentry

1. COURSE CONTENT	2. TIME

3. Safety 2/0 Day 1

a. Given situations involving electrical hazards, analyze the hazard and explain the required safety precautions. STS: 6b MEAS: PC (.5/0)

(1) Electrical hazards

(2) Safety precautions

b. Given incomplete statements, specify safety procedures for working with products containing asbestos fibers. STS: 6a(6) MEAS: PC (.3/0)

(1) Asbestos products

(2) Safety precautions

c. Given incomplete statements, specify procedures used in identification, reporting, and correcting safety hazards. STS: 6c MEAS: PC (.5/0)

(1) Identifying safety hazards

(2) Reporting safety hazards

(3) Correcting safety hazards

d. Given a situation involving a safety hazard and AF Form 457, report the hazard by completing AF Form 457 with no more than two instructor assists. STS: 6c MEAS: PC (.2/0)

(1) AF Form 457

(2) Completing AF Form 457

e. Given incomplete statements, identify requirements for hazardous waste storage by completing the statements. STS: 6d MEAS: PC (.5/0)

(1) Hazardous waste materials

(2) Hazardous waste storage

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SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-I-3, Safety
WB J3ABR55230 000-I-3, Safety
Textbook: Modern Carpentry, Goodheart - Willcox Co., Inc.

Training Methods
Lecture/Discussion (1 hr)
Performance (1 hr)

Instructional Guidance
Familiarize the students with safety. Explain the necessity of obeying all safety precautions. Explain electrical hazards, asbestos hazards, identifying, correcting, and reporting hazards, completing AF Form 457, and hazardous waste storage. Progress Checks 3a, 3b, 3c, 3d and 3e will be administered following the presentation of 3e. Each student will be evaluated on the objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE Carpentry Specialist
BLOCK TITLE Introduction to Carpentry	

1. COURSE CONTENT	2. TIME
4. Base Civil Engineer Organization and Career Field Orientation	0/2
a. Given incomplete and matching statements, identify the mission, organization, functions, and responsibilities of CE units. Eight of ten responses must be correct. STS: 5a, 5b MEAS: PC	Day 2 (0/.5)
b. Given incomplete statements, identify property accountability and responsibility by completing the statements. Eight of ten responses must be correct. STS: 5c MEAS: PC	(0/.2)
c. Given incomplete statements, identify the organization of the structural/pavements career field, by completing the statements. Eight of ten responses must be correct. STS: 1a MEAS: PC	(0/.5)
d. Given incomplete statements, identify the duties, responsibilities, and career ladder progression requirements of AFSs 55230/50. Six of eight responses must be correct. STS: 1b, 1c MEAS: PC	(0/.5)

SUPERVISOR APPROVAL OF LESSON PLAN

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e. Given incomplete statements, identify Engineered Performance Standards (EPS) by completing the statements. Eight of ten responses must be correct. STS: 5g MEAS: PC (0/.3)

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials

SG J3ABR55230 000-I-4, Base Civil Engineer Organization and Career Field Orientation
WB J3ABR55230 000-I-4, Base Civil Engineer Organization and Career Field Orientation
DS J3ABR55230 000, Directed Study Assignments
DS AFS 54, 55, and 56, Engineered Performance Standards

Training Methods

Directed Study (2 hrs)
Performance (0/hr)

Instructional Guidance

Directed study will be assigned on day 2. The assignment will be checked at the beginning of day 3. Progress Checks, 4a, 4b, 4c, 4d, and 4e will be administered prior to beginning the presentation on day 3. Each student will be evaluated on the objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE Carpentry Specialist

BLOCK TITLE
Introduction to Carpentry

1. COURSE CONTENT	2. TIME
5. Construction Materials	3/0
a. Given incomplete statements, identify the characteristics of construction materials by completing the statements. Twenty of twenty-five responses must be correct. STS: 7e MEAS: PC	Day 2 (3/0)

5. Construction Materials

a. Given incomplete statements, identify the characteristics of construction materials by completing the statements. Twenty of twenty-five responses must be correct. STS: 7e MEAS: PC

(1) Characteristics of construction materials

(2) Uses of construction materials

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-I-5, Construction Materials
WB J3ABR55230 000-I-5, Construction Materials

Training Equipment
Wood Display (15)
Building Hardware Display (15)

Training Methods
Lecture/Discussion (1.5 hrs)
Performance (1.5 hrs)

Instructional Guidance
Discuss the various types of construction materials and their uses. Progress Check 5a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

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PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE Carpentry Specialist

BLOCK TITLE
Introduction to Carpentry

1. COURSE CONTENT	2. TIME
6. Construction Drawings	1.5/1 Day 1 (0/1) Day 2 (1.5/0)

6. Construction Drawings

a. Given building plans, determine the type, location, and configuration of carpentry work for the construction of the building. STS: 7a MEAS: PC

(1) Types of building plans

(2) Interpreting building plans

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-I-6, Construction Drawings
WB J3ABR55230 000-I-6, Construction Drawings
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Methods
Lecture/Discussion (.5 hrs)
Performance (1 hr)
Directed Study (1 hr)

Instructional Guidance
Discuss building plans. Discuss the basic symbols found in the plans and their interpretation. Have students identify information from a set of drawings. An explanation of how DS time and materials will be used is contained in the directed study assignments. Progress Check 6a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

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PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE Carpentry Specialist
BLOCK TITLE Introduction to Carpentry	

1. COURSE CONTENT	2. TIME
7. Hand Tools	7.5/1 Day 1 (0/1) Day 2 (1.5/1)
a. Given illustrations and statements pertaining to hand tools, identify the hand tools, their use, and the maintenance required. Twenty of thirty responses must be correct. STS: 8a, 8b, 8c MEAS: PC (1) Identifying hand tools (2) Use of hand tools (3) Maintenance of hand tools	
b. Given procedures, materials, hand tools, and machines, clean and lubricate the hand tools/machines as necessary with no more than two instructor assists. STS: 8a, 8d MEAS: PC (1) Cleaning hand tools/machines (2) Lubricating hand tools/machines	Day 3 (3/0)
c. Given hand tools, procedures, equipment and working as a member of a team shape and sharpen the hand tools IAW procedures with no more than three instructor assists. STS: 8c MEAS: PC (1) Shaping hand tools (2) Sharpening hand tools	(3/0)

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-I-7, Hand Tools
WB J3ABR55230 000-I-7, Hand Tools
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

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SUPPORT MATERIALS AND GUIDANCE (Con't)

Audio Visual Aids
FLC 23/135, Woodworking - Boring and Drilling
FLC 23/136, Woodworking - Chisels
FLC 23/137, Woodworking - Handsaws
FLC 23/138, Woodworking - Measuring and Layout Tools
FLC 23/139, Woodworking - Planes
FLC 23/141, Woodworking - Sharpening Chisels

Training Equipment
Hand Tools for Woodworking (1)
Bench Grinder (5)

Training Methods
Lecture/Discussion (2.5 hrs)
Performance (5 hrs)
Directed Study (1 hr)

Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance
Explain the uses and maintenance of hand tools. Progress Check 7a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Explain the process of shaping and sharpening hand tools. Progress Check 7b and 7c will be administered following the presentation 7c. Each student will be evaluated on the objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

SUPPORT MATERIALS AND GUIDANCE (Con't)

MIR: The class is divided into 2 groups for criterion 7c during which time the students will shape and sharpen woodworking tools within specifications. One instructor is required for each group to assure each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Introduction to Carpentry

1. COURSE CONTENT	2. TIME
8. Security	0/2 Day 4 (0/2)

a. Given incomplete statements, identify the OPSEC vulnerabilities of AFSC 552X0 by completing the statements. Three of five responses must be correct. STS: 2b(6) MEAS: PC

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-I-8, Security
WB J3ABR55230 000-I-8, Security
DS J3ABR55230 000, Directed Study Assignments

Training Methods
Directed Study (2 hrs)
Performance (0/hrs)

Instructional Guidance
Progress Check 8a will be administered prior to presentation on day 5. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

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PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE Carpentry Specialist

BLOCK TITLE
Introduction to Carpentry

1. COURSE CONTENT	2. TIME
9. Construction Using Hand Tools	10/2
	Day 3
a. Given a task and construction materials and working as a member of a team select and use hand tools to complete the task with no more than four instructor assists. Hand tools must be used correctly and finished project must be within 1/8" of square and within 1/8" of dimensions shown on student's rough plan. All joints must fit tightly. STS: 8a, 13b MEAS: PC	(0/2) Day 4 (6/0) Day 5 (3/0)
(1) Project construction	
(2) Hand tool application	
b. Given construction tools and equipment, a task and working as a member of a team select the required materials to complete the assigned task. All safety precautions pertaining to use of ladders, lifting and handling of materials will be observed. STS: 6a(3), 6a(4), 6a(5) MEAS: PC	(1/0)
(1) Safe working habits	
(2) Wearing safety equipment	

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-I-9, Construction Using Hand Tools
WB J3ABR55230 000-I-9, Construction Using Hand Tools
DS J3ABR55230 000-I-9, Directed Study Assignments
Textbooks: Modern Carpentry, Goodheart-Willcox Co., Inc.
Modern Woodworking, Goodheart-Willcox Co., Inc.

Training Equipment
Hand Tools for Woodworking (1)

Training Methods
Lecture/Discussion (2 hrs)
Performance (8 hrs)
Directed Study (2 hrs)

SUPERVISOR APPROVAL OF LESSON PLAN

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Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance
For criterion objective 9a, explain the process used to cut material to a specified dimension. Explain the importance of checking edges and angles. Explain the steps in sanding project material. Discuss the different types of joints to be used. Discuss the steps in project completion. The students will cut and assemble a specified project using woodworking hand tools. All pieces of the project must be cut to the exact specified dimensions with each joint pre-assembled and checked for accuracy before final assembly. Reinforce safety precautions while using hand tools. Progress Checks 9a and 9b will be accomplished concurrently following the presentation of 9b. Each student will be evaluated on the objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class will be divided into teams of at least two students per project for 5 hours of day 4 and for 4 hours of day 5 for the purpose of having the student accomplish performance in which they measure and cut and shape materials to prescribed dimensions. Two instructors are required to assure that each student accomplishes the prescribed activities and develops the desired skills.

10. Written Test and Test Critique 2/0

11. Military Training (Physical Conditioning) 0/2

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR

COURSE TITLE: Carpentry Specialist

BLOCK TITLE: Cabinet Construction

1. COURSE CONTENT	2. TIME
1. Selecting and Cutting Materials for Cabinet Construction	18/4

Day 5

a. Given power tools, materials, equipment and working as a member of a team exercise safety precautions while operating electrically powered tools and equipment. STS: 6a(1), 6a(2) MEAS: PC — (0/2) Day 6 (2/2)

(1) Power tool safety

(2) Safety equipment

Day 6

b. Given procedures, a cabinet plan, power tools, equipment, materials and working as a member of a team cut materials to within ± 1/16" of specifications with no more than five instructor assists. Cutting must be accomplished in sequence using the correct power tool for each cutting task. STS: 8a, 8b MEAS: PC — (4/0) Day 7 (6/2) Day 8 (6/0)

(1) Power tool operation

(2) Power tool adjustment

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-II-1, Selecting and Cutting Materials for Cabinet Construction
WB J3ABR55230 000-II-1, Selecting and Cutting Materials for Cabinet Construction
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Woodworking, Goodheart-Willcox, Co., Inc.

Training Equipment
Radial Arm Saw (5)
Jointer (8)
Surface Planer (15)
Table Saw (5)
Band Saw (8)
Jig Saw (15)
Saber Saw (5)
Router (5)
Shaper (15)
Circular Saw (5)
Drill Press (8)
Mortiser (15)

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SUPPORT MATERIALS AND GUIDANCE (CONT'D)

Training Methods
Lecture/Discussion (4 hrs)
Demonstration/Performance (14 hrs)
Directed Study (4 hrs)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
For criterion objective 1a, discuss electrically powered tool safety and safety equipment. For criterion objective 1b, discuss and demonstrate operating and adjusting power equipment and explain safety equipment usage and safety precautions while using power tools. Students will then adjust and operate power equipment as they cut material for their cabinets. Progress Checks 1a and 1b will be administered following the presentation of 1b. Each student will be evaluated on the objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into 3 groups of not more than six students during 2 hours of day 6 and 6 hours of days 7 and 8, during which time the students will operate shop equipment and cut material for their project. One instructor is required for each group to assure that each student accomplishes the required instructional activities and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Cabinet Construction

1. COURSE CONTENT	2. TIME
2. Cabinet Assembly	6/2 Day 8 (0/2) Day 9 (6/0)

a. Given procedures, tools, previously cut lumber, cabinet plan, materials and working as a member of a team,assemble a cabinet with no more than three instructor assists. Cabinet joints must be tight, square, and within ± 1/16" of true. STS: 13b
MEAS: PC

(1) Types of cabinet construction

(2) Cabinet assembly

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-II-2, Cabinet Assembly
WB J3ABR55230 000-II-2, Cabinet Assembly
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Woodworking, Goodheart-Willcox Co., Inc.

Training Equipment
Hand Tools for Cabinet Making (15)

Training Methods
Lecture/Discussion (1 hr)
Performance (5 hrs)
Directed Study (2 hrs)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Discuss cabinet, shelf, and bin assembly. Have students assemble their cabinets. Progress Check 2a will be administered following th presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

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MIR: The class is divided into 3 groups of not greater than six students per group for 5 hours of day 9, during which the students complete cabinet construction. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE

Cabinet Construction

1. COURSE CONTENT	2. TIME
3. Surface Sanding	6/2 Day 9 (0/2) Day 10 (6/0)

a. Given procedures, an assembled cabinet, power tools, materials and working as a member of a team sand a cabinet with no more than two instructor assists. Surfaces must be smooth and free of scratches and splinters. STS: 8a, 8b, 13b MEAS: PC

(1) Power sanders

(2) Sanding procedures

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-II-3, Surface Sanding
WB J3ABR55230 000-II-3, Surface Sanding
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Woodworking, Goodheart-Willcox, Co., Inc.

Training Equipment
Disc Belt Sander (8)
Portable Belt Sander (8)
Vibrating Sander (3)

Training Methods
Lecture/Discussion (1 hr)
Performance (5 hrs)
Directed Study (2 hrs)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Discuss power sanders and sanding procedures. Progress Check 3a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

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MIR: The class is divided into 3 groups of not greater than six students per group during 5 hours of day 10, during which time the students will receive a demonstration and sand project using a disc belt sander and portable electric sander. One instructor is required for each group to provide the demonstration and assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Cabinet Construction

1. COURSE CONTENT	2. TIME
4. Laminated Plastic	4/0 Day 11 (4/0)

a. Given procedures, a cabinet or bookcase, equipment, materials and working as a member of a team apply and trim laminated plastics with no more than four instructor assists. Laminate must be bonded, smooth, flush with the edges, and beveled. STS: 13d MEAS: PC

(1) Characteristics

(2) Application

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-II-4, Laminated Plastic
WB J3ABR55230 000-II-4, Laminated Plastic
Textbook: Modern Woodworking, Goodheart-Willcox Co., Inc.

Training Equipment
Table Saw (4)
Router (4)
Shaper (4)

Training Methods
Lecture/Discussion (1 hr)
Performance (3 hrs)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Discuss the uses and installation procedures for laminated plastic. Demonstrate methods for cutting laminated plastics. Divide students into groups to cut and install laminated plastic. Have students trim edges of installed laminated plastic. Have students use a file and remove sharp edges from plastic laminate. Progress Check 4a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

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SUPPORT MATERIALS AND GUIDANCE (CONT'D)

MIR: Students will be divided into groups not to exceed 6 students per group for 3 hours in day 11 to install and trim laminated plastic and shape material. One instructor is required for each group to provide the demonstrations and assure that each student accomplishes the required instructional objectives and develops the desired skills.

5.	Written Test and Test Critique	2/0
6.	Military Training (Physical Conditioning)	0/2

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTION	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Building Construction

1. COURSE CONTENT	2. TIME

1. Foundation and Form Construction 3/2

a. Given incomplete statements, identify the location, construction, and erection procedures for forms for slabs, walls, footings, ramps, and steps by completing the statements. STS: 9a(1), 9a(2), 9a(3), 9a(4), 9a(5) MEAS: PC Day 11 (0/1) Day 12 (1/0)

(1) Types of forms

(2) Form construction

b. Given procedures, tools, materials, equipment and working as a member of a team construct a form for a concrete slab with no more than three instructor assists. The completed form must be within ± 1/8" of square and level. STS: 9a(2) MEAS: PC Day 11 (0/1) Day 12 (2/0)

(1) Slab form components

(2) Slab form construction procedures

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-III-1, Foundation and Form Construction
WB J3ABR55230 000-III-1, Foundation and Form Construction
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox, Co., Inc.

Audio Visual Aids
Film: MN 6719a, Building Techniques, Foundations and Concrete

Training Equipment
Hand Tools for Light Frame Construction (15 hr)
Portable Power Tools (8)

Training Methods
Lecture/Discussion (1 hr)
Performance (2 hrs)
Directed Study 2 hrs)

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Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Students will prepare for criterion objectives 1a and 1b through Directed Study on day 11. On first hour of day 12, instructor will explain types of forms and form construction and show film. Progress Check 1a will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will begin teaching criterion objective 1b during second hour of day 12 by discussing slab form components and the procedures for building a slab form. Instructor will then take the students to the work area where Progress Check 2a will be administered. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into 3 groups of not greater than six students per group during 1.5 hours of day 12, during which time the students cut materials and construct a slab form. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Building Construction

1. COURSE CONTENT	2. TIME
2. Light Frame Construction	12/2
a. Given a foundation wall, tools, materials, equipment and working as a member of a team fabricate and install sills, joists, and subfloors with no more than eight instructor assists. Installed units must be square, plumb, and level. STS: 10a(1), 10a(2), 10a(3) MEAS: PC	Day 12 (3/1) Day 13 (2/0)
(1) Components	
(2) Fabrication	
(3) Installation	
b. Given a subfloor, tools, materials, equipment and working as a member of a team fabricate and install walls and partitions and frame openings for windows, doors, louvers, and utilities with no more than eight instructor assists. Installed units and openings must be square and plumb. STS: 10a(4) 10b MEAS: PC	Day 12 (0/1) Day 13 (4/0) Day 14 (3/0)
(1) Components	
(2) Fabrication	
(3) Installation	

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-III-2, Light Frame Construction
WB J3ABR55230 000-III-2, Light Frame Construction
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Audio Visual Aids
Film: MN 6719b, Building Techniques, Framing Floor Joists and Walls

Training Equipment
Hand Tools for Light Frame Construction (15)
Portable Power Tools (8)
Building Structure (Model) (15)

SUPERVISOR APPROVAL OF LESSON PLAN

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Training Methods
Lecture/Discussion (3 hrs)
Performance (9 hrs)
Directed Study (2 hrs)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Students will prepare for criterion objectives 2a and 2b during Directed Study on day 12. Instructor will discuss floor components and show film on day 12. Progress Check 2a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

Instructor will discuss Criterion Objective 2b and show film on wall construction. Progress Check 2b will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into 3 groups of not greater than six students per group during 1.5 hours of day 12, 5 hours of day 13, and 2.5 hours of day 14, during which time the students must layout, cut (using a portable electric saw), and construct wall sections for a wood frame structure, complete with door and window openings. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE

Building Construction

1. COURSE CONTENT	2. TIME
3. Scaffold Construction	1/1 Day 13 (0/1) Day 14 (1/0)

3. Scaffold Construction

a. Given procedures, equipment, materials and working as a member of a team construct, erect, and remove scaffolding with no more than four instructor assists. STS: 9b MEAS: PC

(1) Construction

(2) Erection

(3) Removal

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-III-3, Scaffold Construction
WB J3ABR55230 000-III-3, Scaffold Construction
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Equipment
Hand Tools for Scaffold Construction (5)
Sectional Steel Scaffold (5)
Sawhorses (5)

Training Methods
Lecture/Discussion (.5 hrs)
Performance (.5 hr)
Directed Study (1 hr)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Objective 3a will be taught by directed study and classroom lecture. Progress Check 3a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

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J3ABR55230 000	III	3	10 April 1986	33

SUPPORT MATERIALS AND GUIDANCE (Con't)

MIR: The class is divided into 3 groups of not greater than six students per group for .5 hour in day 14, during which time the students will erect a scaffold to a specified working height. One instructor is required for each group to assure each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Building Construction

1. COURSE CONTENT	2. TIME
4. Roof Construction a. Given four installed wall frames, materials, tools, equipment and working as a member of a team fabricate and install rafters and trusses on the wall frames with no more than eight instructor assists. STS: 10a(5) MEAs: PC (1) Components (2) Fabrication (3) Installation	5/1 Day 13 (0/1) Day 14 (2/0) Day 15 (3/0)

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-III-4, Roof Construction
WB J3ABR55230 000-III-4, Roof Construction
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Audio Visual Aids
Film: MN 6719c, Building Techniques, Framing Rafter Principles, Common Rafter
Film: FLC 3/0243, Carpentry, Rafter Layout

Training Equipment
Hand Tools for Light Frame Construction (15)
Portable Power Saw (5)

Training Methods
Lecture/Discussion (1 hr)
Performance (4 hrs)
Directed Study (1 hr)

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SUPPORT MATERIALS AND GUIDANCE (Con't)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Criterion objective 4a will be taught by directed study training films, and classroom lecture/discussion. Progress Check 4a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into 3 groups of not greater than six students per group during 1 hour of day 14 and 3 hours of day 15, during which time the students receive a demonstration and then will layout, cut (using a portable electric saw), and construct the roof frame for a wood frame structure. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Cabinet Construction

1. COURSE CONTENT	2. TIME
5. Sheathing	4/2
a. Given true/false statements, identify the procedures for installing wall sheathing, roof sheathing, and exterior building wall paper. STS: 11a(1), 11b, 12a(1) MEAS: PC	Day 14 (0/1) Day 15 (1/0)
(1) Nomenclature	
(2) Uses	
b. Given a roof frame, a wall frame, materials, tools, equipment and working as a member of a team install wall sheathing, roof sheathing, and exterior wall building paper with no more than five instructor assists. STS: 11a(1), 11b, 12a(1) MEAS: PC	Day 14 (0/1) Day 15 (2/0) Day 16 (1/0)
(1) Wall sheathing installation	
(2) Roof sheathing installation	
(3) Exterior wall building paper installation	

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-III-5, Sheathing
WB J3ABR55230 000-III-5, Sheathing
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Equipment
Hand Tools and Light Frame Construction (5)

Training Methods
Lecture/Discussion (1 hr)
Performance (3 hrs)
Directed Study (2 hrs)

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Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Criterion objective 5a will be accomplished by directed study and classroom lecture/discussion. Progress Check 5a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

To teach criterion objective 5b, instructor will discuss the installation of wall and roof sheathing and exterior wall building paper. Progress Check 5b will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: This class is divided into 3 groups of not greater than six students per group during 3 hours of day 15, during which time the students will install wall and roof sheathing to the exterior of a wood frame structure. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE Carpentry Specialist
BLOCK TITLE Building Construction	

1. COURSE CONTENT	2. TIME
6. Roofing, Vents, and Louvers	4/0
a. Given incomplete statements, identify the procedures for installing, repairing, and replacing ventilators, and wall louvers by completing the statements. Four of five responses must be correct. STS: 11a(7), 12a(6) (1) Nomenclature (2) Uses	Day 16 (.5/0)
b. Given procedures, a sheathed roof, materials, tools, equipment, manufacturers' specifications and working as a member of a team install vents and ventilators with no more than five instructor assists. STS: 12a(6) (1) Vent installation (2) Ventilator installation	Day 16 (1.0/0)
c. Given procedures, a sheathed roof, materials, tools, equipment and working as a member of a team install roof flashing, eave strips, and roofing with no more than eight instructor assists. STS: 12a(3) 12a(4) (1) Nomenclature (2) Installation	Day 16 (2.5/0)

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-III-6, Roofing, Vents and Louvers
WB J3ABR55230 000-III-6, Roofing, Vents and Louvers
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Equipment
Hand Tools for Building Finish Work (8)

SUPERVISOR APPROVAL OF LESSON PLAN

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Training Methods
Lecture/Discussion (1.5 hrs)
Performance (2.5 hrs)

Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance
For criterion objective 6a, discuss types and uses of vents, ventilators and louvers. Progress Check 6a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will discuss installation of vents and ventilators. Progress Check 6b will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will discuss the types of and installation procedures for roof flashing, eave strips, and roofing. Progress Check 6c will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into 2 groups for 3 hours of day 16 during which time the students install roofing and building vents. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR

COURSE TITLE
Carpentry Specialist

BLOCK TITLE
Building Construction

1. COURSE CONTENT	2. TIME

7. Trim and Siding 5/2

a. Given true/false statements, identify the procedures for installing, repairing, and replacing cornice and siding. STS: 11a(2) 12a(2) MEAS: PC

Day 15 (0/1)
Day 16 (1/0)
Day 17 (1/0)

(1) Nomenclature

(2) Uses

b. Given procedures, a framed structure, materials, tools, equipment and working as a member of a team install cornice and siding with no more than seven instructor assists. STS: 11a(2), 12a(2) MEAS: PC

Day 15 (0/1)
Day 17 (1/0)

(1) Types

(2) Installation

c. Given a structure, materials, tools, equipment and working as a member of a team install exterior wall trim with no more than five instructor assists. STS: 11a(6) MEAS: PC

Day 17 (2/0)

(1) Nomenclature

(2) Installation

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-III-7, Trim and Siding
WB J3ABR55230 000-III-7, Trim and Siding
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Equipment
Hand Tools for Building Finish Work (15)
Asbestos Shingle Cutter (15)

Training Methods
Lecture/Discussion (1 hr)
Performance (4 hrs)
Directed Study (2 hrs)

SUPERVISOR APPROVAL OF LESSON PLAN

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Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance
For criterion objective 7a, discuss parts and uses of cornices and siding. Progress Check 7a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will discuss types of and installation procedures for cornices and siding. Progress Check 7b will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will explain parts and installation procedures for exterior wall trim. Progress Check 7c will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

MIR: The class is divided into two instructional groups for 3 hours on day 17 during which the students receive a demonstration and then install trim and cornice, and install siding. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

8.	Written Test and Test Critique	2/0
9.	Military Training (Physical Conditioning)	0/2

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Finish Construction

1. COURSE CONTENT	2. TIME
1. Stairs	3.5/1 Day 17 (0/1) Day 18 (3.5/0)

a. Given tools, equipment, materials and working as a member of a team construct and install steps with no more than five instructor assists. The steps must be plumb and level.
STS: 10a(6) MEAS: PC

(1) Types of stairways

(2) Stair nomenclature

(3) Stair layout

(4) Stair installation

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-IV-1, Stairs
WB J3ABR55230 000-IV-1, Stairs
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Audio Visual Aids
Film: MN 6719f, Building Techniques - Fundamentals of Stair Layout

Training Equipment
Hand Tools (5)
Portable Power Tools (5)

Training Methods
Lecture/Discussion (1.5 hrs)
Performance (2.0 hrs)
Directed Study (1 hr)

Multiple Instructor Requirements
Equipment, Supervision (2)

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Instructional Guidance
Instructor will teach stairway components and procedures for stairway construction during classroom lecture/discussion. Progress Check 1a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: This class is divided into 2 groups of not greater than eight students per group for 3 hours of day 18, during which time the students receive a demonstration and then will layout and cut stair stringers and construct a set of stairs for a given application. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Finish Construction

1. COURSE CONTENT	2. TIME
2. Windows, Screens, and Glass	4/2
a. Given incomplete statements, identify the procedures for installing or replacing window units, screens, and glass by completing the statements STS: 11a(3), 11a(4), 11c MEAS: PC (1) Nomenclature (2) Types and uses	Day 17 (0/1) Day 18 (1.5/0)
b. Given procedures, window frame, sash, tools, materials and working as a member of a team install the window frame and sash in an exterior wall with no more than five instructor assists. The window must operate without binding and be within ± 1/8" of plumb. STS: 11a(3) MEAS: PC (1) Window frame installation (2) Window sash installation	Day 18 (.5/0)
c. Given procedures, screen, materials, tools, equipment and working as a member of a team install screen materials in a frame with no more than five instructor assists. The installed screen must be tight and free of wrinkles. STS: 11a(4) MEAS: PC (1) Materials (2) Installation	Day 18 (.5/0)
d. Given window glass, tools, materials, equipment and working as a member of a team replace the glass in a window frame with no more than five instructor assists. The installed window glass must fit tightly and be water tight. STS: 11c MEAS: PC (1) Measuring and cutting (2) Sash preparation (3) Glazing	Day 18 (0/1) Day 19 (.5/0)

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e. Given procedures, safety equipment, glass, tools and working as a member of a team exercise safety precautions while handling glass. 6a(5) MEAS: PC	Day 19 (.5/0)

(1) Equipment

(2) Precautions

f. Given procedures, a window, tools, equipment and working as a member of a team realign the window frame with no more than three instructor assists. The window must operate freely without binding. STS: 11d MEAS: PC	Day 19 (.5/0)

(1) Materials

(2) Realignment

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-IV-2, Windows, Screens and Windows
WB J3ABR55230 000-IV-2, Windows, Screens and Windows
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Equipment
Window Frames (1)
Hand Tools for Building Finish Work (15)
Window Unit Mock-up (15)
Glass Cutting Unit (15)

Training Methods
Lecture/Discussion (1 hr)
Performance (3 hrs)
Directed Study (2 hrs)

Multiple Instructor Requirements
Equipment, Supervision (3)

Instructional Guidance
Instructor will explain terminology and installation procedures during lecture/discussion. Progress Checks 2a, 2b, 2c and 2f will be administered after each applicable objective. Progress Checks 2d and 2e will be administered after presentation of 2e. Each student will be evaluated on the objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

SUPPORT MATERIALS AND GUIDANCE (Con't)

Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into two instructional groups during 1.5 hours in day 18 and 1 hour of day 19, during which time the students receive a demonstration and then install windows, repair sashes by replacing glass and repair screen. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Finish Construction

1. COURSE CONTENT	2. TIME
3. Doors and Door Hardware	10.5/3
a. Given incomplete statements, identify the procedures for installing, replacing or repairing doors, door trim, and door hardware. STS: 11a(5), 11a(6) 11d, 13a(2), 13a(6) MEAS: PC	Day 18 (0/1) Day 19 (1.5/0)
(1) Nomenclature	
(2) Types and uses	
b. Given procedures, materials, equipment, a rough opening for an exterior door and working as a member of a team fabricate and install an exterior door frame and exterior door with no more than five instructor assists. The door frame must be within ± 1/16" of plumb and level and the door must operate without binding. STS: 11a(5) MEAS: PC	Day 19 (1.5/0)
(1) Fabrication	
(2) Installation	
c. Given procedures, materials, equipment, a rough opening for an interior door and working as a member of a team install the interior door frame and door with no more than five instructor assists. The door frame must be within ± 1/16" of plumb and level and the door must operate without binding. STS: 13a(6) MEAS: PC	Day 19 (1.5)
(1) Materials	
(2) Installation	
d. Given procedures, an exterior door, a framed opening, tools, materials, equipment and working as a member of a team install door trim with no more than five instructor assists. Door trim must fit smoothly. STS: 11a(6) MEAS: PC	Day 20 (1.0)
(1) Nomenclature	
(2) Installation	

SUPERVISOR APPROVAL OF LESSON PLAN

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e. Given specifications, an installed exterior door, materials, tools, equipment and working as a member of a team install weather stripping with no more than five instructor assists. Weather stripping must allow door to close and seal out air around door edges. STS: 13a(2) MEAS: PC — Day 20 (1.0)

(1) Nomenclature

(2) Installation

f. Given a damaged exterior door, materials, tools, equipment and working as a member of a team repair the door with no more than five instructor assists. The door must present a smooth and neat appearance, fit into the door frame and operate without binding. STS: 11d MEAS: PC — (1.0)

(1) Nomenclature

(2) Installation — Day 19 (0/2)

g. Given specifications, an exterior door hanging in an opening, materials, tools, equipment and working as a member of a team install door locks and closers with no more than two instructor assists. Locks must allow door to close and latch tightly. Closers must enable door to close smoothly without slamming. STS: 13g MEAS: PC — Day 20 (3/0)

(1) Nomenclature

(2) Installation

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Material
SG J3ABR55230 000-IV-3, Doors and Door Hardware
WB J3ABR55230 000-IV-3, Doors and Door Hardware
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Equipment
Miter Box (4)
Hand Tools for Building Finish Work (15)
Door Unit Mock-up (15)

Training Methods
Lecture/Discussion (2 hrs)
Performance (8.5 hrs)
Direted Study (3 hrs)

Multiple Instructor Requirements

Equipment, Supervision (2)

Instructional Guidance

Instructor will explain door and door hardware components and installation procedures during lecture/discussion. Progress Check 3a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

Instructor will take students to work area for administration of Progress Checks 3b, 3c, 3d, 3e, 3f, and 3g. Progress checks 3b through 3g will be administered after presentation of 3g. Each student will be evaluated on these objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into two instructional groups for 8 hours in days 19 and 20, during which time the students receive a demonstration and then install door frames, door locks and hinges, and weatherstripping. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Finish Construction

1. COURSE CONTENT	2. TIME
4. Insulation, Gypsum Board, and Ceilings	10/2
a. Given incomplete statements, identify the procedures for installing, repairing, or replacing gypsum board, and ceilings. STS: 13a(1), 13a(3), 13a(5) MEAS: PC	Day 20 (0/1) Day 21 (1.5/0)
(1) Nomenclature	
(2) Types and Uses	
b. Given procedures, insulation, tools, materials, equipment and working as a member of a team install insulation in an interior wall with no more than four instructor assists. Insulation must be securely fastened; joints must be overlapped with no voids. STS: 13a(1) MEAS: PC	Day 20 (0/1) Day 21 (1.5/0)
(1) Nomenclature	
(2) Installation	
c. Given procedures, gypsum board, tools, materials, equipment and working as a member of a team install gypsum board on an interior wall and ceiling with no more than three instructor assists. The gypsum board must be securely fastened and the joints must not exceed 1/8" in width. STS: 13a(3) MEAS: PC	Day 21 (1.5/0)
(1) Nomenclature	
(2) Installation	
d. Given procedures, acoustical tile, tools, materials, equipment and working as a member of a team install tile on a ceiling with no more than four instructor assists. Tile edges must fit tightly and be flush with all adjoining tile. STS: 13a(5) MEAS: PC	Day 21 (1.5/0)
(1) Nomenclature	
(2) Installation	

SUPERVISOR APPROVAL OF LESSON PLAN

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e. Given procedures, a room, materials, equipment and working as a member of a team install a suspended ceiling with no more than five instructor assists. The finished ceiling must be secured and within ± 1/8" of level. STS: 13a(9) MEAS: PC

Day 22
(4/0)

(1) Nomenclature

(2) Installation

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-IV-4, Insulation, Gypsum Board, and Ceilings
WB J3ABR55230 000-IV-4, Insulation, Gypsum Board, and Ceilings
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.

Training Equipment
Carpentry Hand Tools

Training Methods
Lecture/Discussion (2 hrs)
Performance (8 hrs)
Directed Study (2 hrs)

Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance
Instructor will explain terminology and installation procedures for insulation, gypsum board, and ceilings during classroom lecture/discussion. Progress Check 4a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will take students to work area for administration of Progress Checks 4b, 4c, 4d, and 4e. Progress checks 4b through 4e will be measured after the presentation of 4e. Each student will be evaluated on these objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

MIR: The class will be divided into two instructional groups for 8 hours in days 21 and 22, during which time the students receive demonstrations and then install insulation, gypsum board, acoustical material and suspended ceiling. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

5. Written Test and Test Critique 2/0

6. Military Training (Physical Conditioning) 0/2

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR

COURSE TITLE
Carpentry Specialist

BLOCK TITLE
Prefab Buildings and Building Repair

1. COURSE CONTENT — 2. TIME

1. Paneling and Trim 6/2 (0/2)

a. Given incomplete statements, identify the procedures for installing paneling by completing the statements. STS: 13a(4) MEAS: PC Day 22 (0/2) Day 23 (1/0)

(1) Nomenclature

(2) Characteristics and uses

b. Given procedures, paneling, tools, materials, equipment and working as a member of a team panel an existing wall with no more than two instructor assists. Paneling must be securely fastened to the wall, plumb, and all joints must be butted. STS: 13a(4) MEAS: PC Day 23 (2.5/0)

(1) Description

(2) Installation

c. Given tools, materials, equipment and working as a member of a team cut and install trim with no more than two instructor assists. The joints must be tight and smooth. STS: 13a(8) MEAS: PC Day 23 (2.5/0)

(1) Description

(2) Installation

SUPPORT MATERIAL AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-V-1, Paneling and Trim
WB J3ABR55230 000-V-1, Paneling and Trim
DS J3ABR55230 000, Directed Study Assignments
Textbook: Modern Carpentry, Goodheart-Wilcox Co., Inc

Training Equipment
Carpentry Hand Tools (8)

Training Methods
Lecture/Discussion (1 hr)
Performance (5 hrs)
Directed Study (2 hrs)

SUPPORTVISOR APPROVAL OF LESSON PLAN

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Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance

Instructor will explain components, uses, terminology, and installation procedures for paneling and trim during classroom lecture/discussion. Progress Check 1a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will take students to the work area for administration of progress checks 1b and 1c. Progress check 1b and 1c will be adminstered after presentation of 1c. Each student will be evaluated on these objectives using ATC Form 98. The grade will be "S" for satisfactory or "U" unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into two instructional groups for 5 hours in day 23, during which time the students will install paneling and interior trim. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Prefaab Buildings and Building Repair

1. COURSE CONTENT	2. TIME
2. Prefab Buildings	12/4 Day 23 (0/2)
a. Given incomplete statements, identify the procedures for assemblying and erecting prefabricated buildings by completing the statements. STS: 14a MEAS: PC	Day 24 (3/0)
(1) Nomenclature	
(2) Types and Uses	
b. Given erection procedures, materials, tools, equipment, foundation and working as a member of a team assemble and erect a prefabricated building with no more than three instructor assists. The erected prefabricated building must be securely fastened and be within ± 1" of plumb and square. STS: 14a MEAS: PC	Day 24 (3/2) Day 25 (6/0)
(1) Materials	
(2) Assembly	
(3) Erection	

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-V-2, Prefab Buildings
WB J3ABR55230 000-V-2, Prefab Buildings
Manufacturer's Assembly and Erection Procedures for a Metal Prefab Building
Textbook: Modern Carpentry, Goodheart-Willcox Co., Inc.
DS AFS 54, 55, and 56, Engineered Performance Standards

Training Equipment
Prefabricated Building (5)
Hand Tools for Erecting Prefabricated Buildings (8)

Training Methods
Lecture/Discussion (3 hrs)
Performance (9 hrs)
Directed Study (4 hrs)

SUPERVISOR APPROVAL OF LESSON PLAN

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Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance

Instructor will explain the types, uses and terminology of prefabricated buildings. Progress Check 2a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on ATC Form 667. Instructor will take students to the work area for administration of Progress Check 2b. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

MIR: The class is divided into two instructional groups during 3 hours of day 24 and 6 hours of day 25, during which time the students assemble and erect a metal prefab building. One instructor is required for each group to assure that each student accomplishes the instructional objectives and develops the desired skills.

PLAN OF INSTRUCTION/LESSON PLAN PART I

NAME OF INSTRUCTOR	COURSE TITLE
	Carpentry Specialist

BLOCK TITLE
Prefaab Buildings and Building Repair

1. COURSE CONTENT	2. TIME
3. Flooring, Caulking, and Prefab Units	9/0
a. Given incomplete statements, identify procedures for installing, repairing, or replacing flooring, caulking, and prefab units by completing the statements. STS: 13e, 13a(7), 13c, 13h MEAS: PC (1) Nomenclature (2) Types and Uses	Day 26 (2/0)
b. Given procedures, a wooden floor, tools, materials, equipment and working as a member of a team repair a damaged area of flooring with no more than two instructor assists. The repaired area must be securely fastened and match the existing floor. STS: 13e MEAS: PC (1) Terminology (2) Repair	Day 26 (2/0)
c. Given procedures, a tiled floor, tools, materials, equipment and working as a member of a team repair a damaged section of flooring with no more than two instructor assists. The repaired area must be securely fastened with no bulges, and all joints must be tight. STS: 13a(7) MEAS: PC (1) Terminology (2) Repair	Day 26 (2/0)
d. Given procedures, a prefabricated cabinet or bookcase, tools, materials, equipment and working as a member of a team instal the cabinet or bookcase with no more than two instructor assists. The installed unit must be securely fastened, plumb and level. STS: 13c MEAS: PC (1) Terminology (2) Installation	Day 27 (2/0)
e. Given procedures, tools, materials, equipment and working as a member of a team caulk windows with no more than two instructor assists. Caulked areas must be overlayed 1/8" and present a smooth and even appearance. STS: 13h MEAS: PC (1) Terminology (2) Procedures	Day 27 (1/0)

SUPERVISOR APPROVAL OF LESSON PLAN

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COURSE CONTENT

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
SG J3ABR55230 000-V-3, Flooring, Caulking, and Prefab Units
WB J3ABR55230 000-V-3, Flooring, Caulking, and Prefab Units

Training Equipment
Carpentry Hand Tools (8)

Training Methods
Lecture/Discussion (2 hrs)
Performance (7 hrs)

Multiple Instructor Requirements
Equipment, Supervision (2)

Instructional Guidance
Instructor will explain flooring, caulking, and prefab cabinet installation during classroom lecture/discussion. Progress Check 3a will be administered following the presentation. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory or "U" for unsatisfactory. This grade will be placed on the ATC Form 667. Instructor will take students to work are for administration of Progress Checks 3b, 3c, 3d, and 3e. Progress checks 3b through 3e will be administered follow presentation of 3e. Each student will be evaluated on the objective using ATC Form 98. The grade will be "S" for satisfactory and "U" for unsatisfactory. This grade will be placed on the ATC Form 667.

MIR: The class is divided into two instructional groups during 4 hours of day 26 and 3 hours of day 27, during which time the students replace wood flooring, repair asphalt tile, caulk windows, sinks, or bathtubs, and install prefabricated cabinets or bookcases. One instructor is required for each group to assure that each student accomplishes the required instructional objectives and develops the desired skills.

4.	Written Test and Test Critique	2/0
5.	Course Critique and Graduation	1/0
6.	Military Training	0/6
	a. Physical conditioning	(0/2)
	b. End-of-Course Appointments and Predeparture Safety Briefing	(0/4)

DIRECTED STUDY
J3ABR55230 000

Technical Training

Carpentry Specialist

DIRECTED STUDY ASSIGNMENTS

May 1986

USAF TECHNICAL TRAINING SCHOOL

3770 Technical Training Group

Sheppard Air Force Base, Texas

DESIGNED FOR ATC COURSE USE ONLY
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3770 Technical Training Group
Sheppard Air Force Base, Texas

DS J3ABR55230 000
May 1986

DIRECTED STUDY ASSIGNMENTS

INTRODUCTION

These assignments support specific criterions and will be completed in the dormitory area during the 7th and 8th hours of each training day, except on the final day of the course.

The instructor will check the next day for completion of the DS assignments and give an oral or written quiz. Achievement of the assignment will be a minimum passing score of 70%. Failure of the quiz will result in special individual assistance during the 7th and 8th hour of the same training day. In the event of special individual assistance being given, all DS assignments are still due the following training day.

The material listed in this Directed Study assignment sheet will be accomplished the day prior to the lecture to ensure students have a basic understanding of the material being covered in class that day. (Except for the material covered in class during day 1). This material will be read along with Directed Study assignment listed under day 1 to ensure students fully understand the material covered the first day of class.

ASSIGNMENTS

BLOCK I

Day 1

1. Review material covered in day 1, Technical Publications and Safety, SG, Chapters 2 and 3 and answers the questions on pgs 2-7 and 3-21.

Day 2

1. Read SG, Chapter 4, Base Civil Engineer Organization and Career Field Orientation. Pgs 4-1 through 4-13 and answer the questions on pg 4-13.
2. Read SG, Chapter 6 on Construction Drawings and answer the questions on pags 7-60 and 7-61.
3. Read SG, Chapter 7 on Hand Tools and answer the questions on pgs 7-60 and 7-61.

Day 3

1. Read SG, Chapter 8 on Security and answer the questions on pg 8-4.

2. Read SG, Chapter 9 on Construction Using Hand Tools.

3. Accomplish reading assignments located in your Modern Woodworking Textbook, Chapter 2, Selecting and Roughing Out Materials, pages 21 through Laying Out and Cutting Plywood, on pg 31. Also answer questions 1-12 on pg 34.

   Read Chapter 5 in your Modern Woodworking Textbook on Wood Joints, pgs 59 through 72, and answer questions 1-15 on pg 73.

   Also read Chapter 9 on Sanding and Preparing for Finish on pgs 111-117.

BLOCK II

Day 5

1. Read Unit 1 in Study Guide J3ABR55230 000-II-1 on Selecting and Cutting Materials for Cabinet Construction, pgs 1-1 through 1-22.

2. Read Unit 11 located in Modern Woodworking Textbook, pgs 152 through 163, About Jointers and Planners.

3. Read Unit 12 located in Modern Woodworking Textbook, pgs 167 through 179, about The Table Saw, also read pgs 186 through 190 and stop at Circular Saws.

4. Read Unit 13 located in Modern Woodworking Textbook on the Band Saw, Jigsaw, and Sabre Saw on pgs 201 through 215.

Day 6

1. Read Unit 14, located in Modern Woodworking Textbook, on the Drill Press and Mortiser, pgs 217 through 223 and pgs 226 through 228.

2. Read Unit 7, located in Modern Woodworking Textbook on Sanding Machines, pgs 269 through 275.

3. Read Unit 16, located in Modern Woodworking Textbook on The Router and Shaper, pgs 253 through 263.

Day 8

1. Read Unit 2 in Study Guide J3ABR55230 000-II-2 on Cabinet Assembly, pgs 2-1 through 2-6.

2. Read Unit 18, located in your Modern Woodworking Textbook, pgs 281 through 304 on Furniture and Cabinet Work.

Day 9

1. Read Unit 3 in Study Guide J3ABR55230 000-II-3, pgs 3-1 through 3-7.

BLOCK III

Day 11

1. Read SG, Unit 1, pgs 1-1 through 1-17, answer the questions on pgs 1-17 and 1-18.

2. Read Unit 6, in Modern Carpentry Textbook, pgs 118 through 146. Stop at Estimating Materials".

Day 12

1. Read SG, Unit 2, pgs 2-1 through 2-23 and answer the questions on pgs 2-23 and 2-24.

2. Read Unit 7 in Modern Carpentry Textbook, pgs 149 through 171.

3. Read Unit 8 in Modern Carpentry Textbook, pgs 172 through 188. Stop at Wall Sheathing.

Day 13

1. Read SG Unit 3, pgs 3-1 through 3-16.

2. Read Unit 22 in Modern Carpentry Textbook, pgs 542 through 549 and answer questions on pgs 548 and 549.

3. Read SG, Unit 4, pgs 4-1 through 4-10.

4. Read Unit 9 in Modern Carpentry Textbook, pgs 198 through 228 and answer questions 1 through 16 on pg 228.

Day 14

1. Read SG, Unit 5, pgs 5-1 through 5-3.
2. Read Unit 8 in Modern Carpentry Textbook, starting at Wall Sheathing on pg 188 through 194, answer questions 11 on pg 194.
3. Read Unit 9 in Modern Carpentry Textbook, starting at Roof Sheathing, pgs 224 through 228 and answer questions 17, 18, and 19 on pg. 228.

Day 15

1. Read SG, Unit 7, pgs 7-1 through 7-15.
2. Read Unit 12 in Modern Carpentry Textbook, pgs 298 through 323 and answer the questions on pgs 322 and 323.

BLOCK IV

Day 17

1. Read SG, Unit 1, pgs 1-1 through 1-10.
2. Read Unit 16 in Modern Carpentry Textbook, pgs 405 through 418 and answer the questions on pg 418.
3. Read SG, Unit 2, pgs 2-1 through 2-11.
4. Read Unit 11 in Modern Carpentry Textbook, pgs 266 through 297 and answer questions 1 through 14 on pg 297.

Day 18

1. Review SG, Unit 2, Replacing Window Glass, pgs 2-1 through 2-6.
2. Read SG, Unit 3, pgs 3-1 through 3-31 and answer the questions on pg 3-31.
3. Read Unit 11 in Modern Carpentry Textbook, beginning with "Exterior Door Frames", pgs 288 through 297.
4. Read Unit 17 in Modern Carpentry Textbook, pgs 4-20 through 4-38. Stop at Window Trim. Answer questions 1 through 10 on pg 443 in Modern Carpentry Textbook.

Day 19

1. Review SG, Unit 3, on Installing Door Locks and Door Closers, pgs 3-15 through 3-18 and 3-24 through 3-26. Stop at Exterior Doors - Repair and Maintenance.

Day 20

1. Read SG, Unit 4, pgs 4-1 through 4-8.
2. Read Unit 13 in Modern Carpentry Textbook, pgs 324 through 327, resume reading on pg 331, beginning with Types of Insulation to pg 348, stopping at Acoustics and Sound Control Also answer questions 1, 2, 3, 6, 7, 8, 9, 10, and 13 on pg 356.
3. Read Unit 14, in Modern Carpentry Textbook, pgs 358 through 387, answer questions 1-17 on pg 387.

BLOCK V

Day 22

1. Read SG, Unit 1, pgs 1-1 through 1-8 and answer the questions on pg 1-8.
2. Read Unit 14 in Modern Carpentry Textbook, beginning with Installing Plywood on pg 371 through 374, Stopping at Plaster. Also answer questions 6, 7, and 8 on pg 387.
3. Read Unit 17 in Modern Carpentry Textbook, beginning with Window Trim on pg 438 through 443, and answer questions 13, 14, and 15 on pg 443.

Day 23

1. Read SG, Unit 2, pgs 2-1 through 2-20 and answer the questions on pg 2-19 and 2-20.
2. Read Unit 21 in Modern Carpentry Textbook, pgs 502 through 511 and answer questions 1 through 7 on pg 511.

Day 24

1. Review SG, Unit 2 and Modern Carpentry Unit 21.

STUDY GUIDE
J3ABR55230 000-I-1 thru 9

TECHNICAL TRAINING

Carpentry Specialist

INTRODUCTION TO CARPENTRY

June 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use

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Purpose of The Study Guide

This study guide (SG) is designed to guide you through your study assignment in the most logical sequence for easy understanding and to provide you with practical exercises or work in conjunction with each study assignment. Complete each exercise or work assignment in the sequence given and it will aid you in understanding and retaining the key points in each assignment.

Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Questions will be addressed at that time. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

SG J3ABR55230-000-I-1 thru 9

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9	Construction Using Hand Tools	9-1

Supersedes SG J3ABR55230-000-I-1 thru -9, Jan 1986.
(Copies of superseded publications may not be used.)

BEST COPY AVAILABLE

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-I-1

ORIENTATION AND COURSE INTRODUCTION

OBJECTIVE

a. Orientation

This study guide is designed to introduce you to course policies and explain the contents of training that you will be receiving while attending the Carpentry Specialist course.

INTRODUCTION

Welcome to the Civil Engineering Carpentry Specialist course. You are now entering an interesting and challenging course designed to teach you the basics of the Carpentry Career Field.

This entire orientation study guide is an introduction. In it, we will attempt to introduce you to the contents, policies, the objectives of the course, the instruction and measurement policies, the type of training materials used, and other items of particular interest to you as a student. Above all, we want you to feel welcome in our course and we will do everything we can to make your time at Sheppard AFB worthwhile and pleasant. The more you put into the course, the more you will get out of it.

The 3770th Technical Training Group consists of four major divisions. Each of these divisions will consist of several individual courses. The Carpentry Course belongs to one of these divisions, the Power Production Division, (see figure 1 for a breakdown). The commander of the 3770th Technical Training Group is a civil engineer, (usually a Colonel or a Lt Colonel) who supervises assigned personnel and is responsible for the quality of training taught within the Group. As a member of any organization it is important that you know your "Chain of Command." Your instructor will provide you with the names of these personnel. Write their names in the blank spaces opposite their title.

Class Leader ______________________________

Instructors

1. ______________________________
2. ______________________________
3. ______________________________

Course Supervisor ______________________________

Division Chief ______________________________

Group Commander ______________________________

Wing Commander ______________________________

Tech Training Center Commander ______________________________

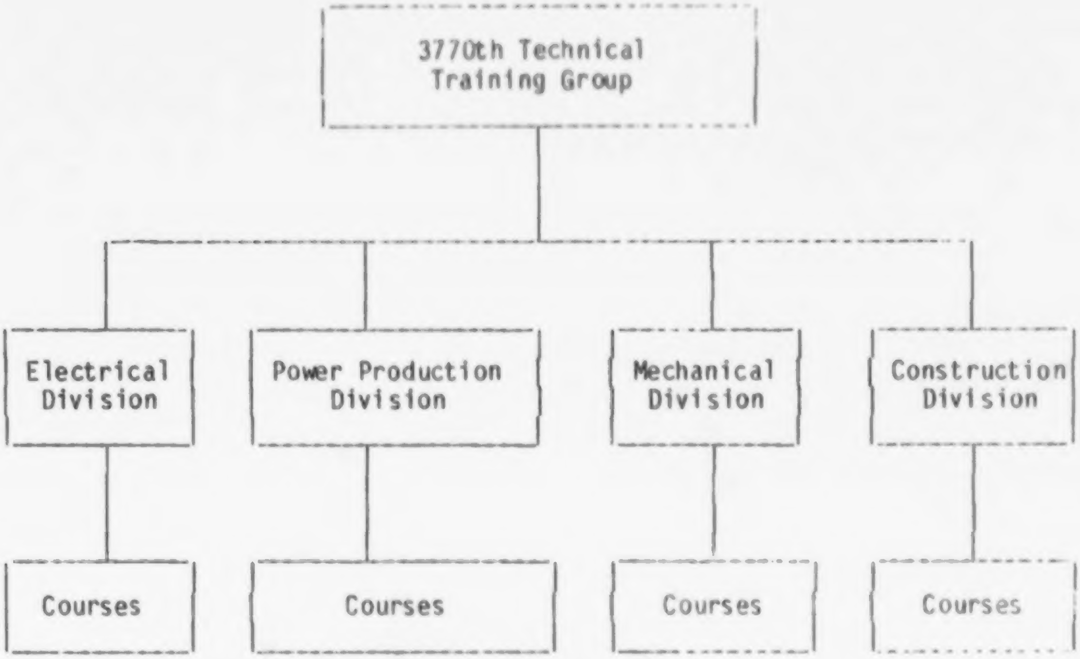
3770th Technical Training Group
Electrical Division
Power Production Division
Mechanical Division
Construction Division
Courses
Courses
Courses
Courses

Figure 1. Group Structure

Overview of the Course

This course consists of five (5) blocks of instruction. The course length is 27 days.

In Block I you will have the opportunity to learn about your career field and what to expect on the job. You will also be given training on the use of technical publications, safety, construction materials, construction drawings, security, and Engineered Performance Standards. The remainder of the block will cover the use and care of hand tools. During this time you will construct a project using hand tools. Block II training consists of shop power equipment. You will receive training on the safe operation and care of the equipment. You will also construct a project using the shop power equipment and will complete the block with training on plastic laminate. Block III training consists of the fundamentals of building construction. You will have actual practice in the construction of a frame structure. Block IV and V consist of interior and exterior building finish work and the erection of a prefabricated structure.

SCHOOL POLICIES AND PROCEDURES

As a student, you are required to abide by the procedures and regulations that govern school activities on this base. These procedures and regulations are established to provide you with the most advantageous training environment possible. This portion of the study guide is devoted to acquainting you with these procedures and regulations.

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Use and Care of Training Materials

Your training materials should be well cared for while you are here and brought to school daily and used to study from each night to learn the material assigned for the next day's work. By doing this, you can expect to gain considerable knowledge while in training.

You will be issued text books. These will be temporarily issued to you for study throughout this course. DO NOT MARK in these text books. When you are assigned questions in the texts, you will answer them on a separate sheet of paper, so they can be turned in to your instructor. At some point during the course, your text books will be collected. If they have been lost or destroyed, you will have to pay for the texts.

You will be issued Study Guides, Workbooks, and other training materials. Your instructor will explain which publications are yours to keep and which publications must be returned instructor. Your Study Guides, for instance are your personal property. You may wish to underline, highlight, or mark in them as your instructor presents the classroom lecture. You will use these publications in reviewing for your Block Tests. You will be issued a separate Study Guide for each block of instruction.

You will be issued Workbooks. These workbooks contain Progress Checks (Progress Checks will be explained later) and will never leave the classroom. You will open them only after your instructor has told you to do so. Progress Checks are CONTROLLED ITEMS. This means the instructor is held accountable for each progress check and must maintain careful control over them.

Class Leader

The class leader will be appointed during the first day of class. This person will usually be the highest ranking individual in the class. If all members of the class have equal grade, the instructor will appoint the class leader. This individual will serve as spokesman for the class, supervise classroom clean up and monitor the class, if the instructor has to leave the class temporarily.

Training Schedule

A schedule of training activities is established by Air Training Command regulation. The regulation requires that no less than 400 minutes per shift be spent in training. To have the best learning situation, the longest time you will sit continuously in the classroom is 60 minutes and for laboratory performance activity, 100 minutes. These limits may be increased for testing.

Breaks

Breaks are authorized during the class hours of instruction so that you may take care of personal needs without missing instruction. A schedule of the authorized time for each break will be posted in the classroom area. It is your responsibility to be back in the classroom on time. At no time will you leave the authorized break area. Responsibility to maintain a clean break area rests with the individuals involved. You will clean up the area after each break.

Emergency Leave Procedures

Inform your family to contact their local Red Cross in case of serious illness or a death in your immediate family. In turn, the Red Cross will notify you through your squadron, and if emergency leave is warranted, arrangements will be made for a speedy departure.

Smoking

Before lighting up, be sure that you are in an authorized smoking area. Areas around the Carpentry course and Building 2001 have been designated and are marked accordingly. Do not discard smoking materials on the ground. Dispose of them in a marked receptacle. Never discard smoking materials in a waste can or a dumpster.

Sick Call

Routine sick call should be taken care of during the hours that class is not in session. If you should become ill while in school, you must obtain an excuse slip before leaving class. In case of serious illness or accident, your instructor will call an ambulance immediately.

Absence From Class

You may be excused from class for legitimate reasons; however, it is desirable that your personal affairs and appointments be conducted so as not to interfere with school. Requests for class excusal must be initiated through your squadron training personnel.

Community College of the Air Force (CCAF) Academic Credits

CCAF currently awards 8 semester hours of credit upon graduation from course J3ABR55230 000, Carpentry Specialist.

In addition, 4 semester hours are awarded for completion of Basic Military Training. This credit may be applied in a CCAF Associate in Applied Science degree program designed for your Air Force speciality. To register in a CCAF degree program, go to the Education Service Office (ESO) at your permanent duty station. The ESO Counselor will explain how you may earn an AAS degree in your specialty.

Student Critique Program

To critique something is to express your opinion about it. A student critique program exists at all ATC Technical Training Centers. This program exists because we are interested in student welfare and the effectiveness of our training. It is based upon the assumption that whatever bothers or distracts the student will adversely affect his learning.

This program gives you the opportunity to express your opinions concerning your training and the entire student environment.

You will be given the opportunity to complete critique forms while in training. You may feel free to express your opinions and give us your constructive criticism.

Since the critique program began in 1966, many improvements have been made as a result of student recommendations. Critiques are administered at the end of all courses, and for some courses students are asked to critique training during the course. Your completed critiques will be given careful consideration because they provide instructors, supervisors, and commanders valuable information for use in improving training and base facilities and services.

In the meantime, should you recognize what you feel is a deficiency or problem, do not wait until you are given a critique form to complete. Any of the following people will be willing to listen to your observations and suggestions: Military or technical instructor; instructor supervisor; student counselors; first sergeant or squadron commander; agency or section supervisors; Commander's Representative, or any senior NCO you have the opportunity to talk with.

We are all vitally interested in your welfare and in improving the effectiveness and efficiency of the training provided. Your sincere cooperation in the critique program can be beneficial to the thousands of students who will follow you.

Fire Evacuation.

Your instructor will inform you as to how a fire alarm is sounded and how to evacuate the building. The number that you should call to report a fire is standardized world-wide, it is 117.

Disaster Control Plan

When a disaster is evident, a signal will be given to warn the base of danger. Your instructor will inform you of your designated shelter and procedures to follow.

Measurement and Progress

Tests

You will be given a written block test at the end of days 5, 11, 17, 22 and 27. Block tests will be averaged to arrive at your final course grade. If you should fail a block of instruction, you will be required to complete that block of instruction again. A grade within 5 points of failure may result in a formal academic counseling by your instructor or course supervisor.

Eliminations

If you fail the same block of instruction two times, you will be eliminated from the course due to academic reasons. This elimination could possibly cause you to be assigned to another career field or result in your being discharged from the Air Force.

Honor Graduate

This program is designed to serve as an incentive to reward those students who have demonstrated outstanding academic performance. Honor Graduates must have maintained an excellent record of conduct in both the school and the squadron. Approximately 10 percent of the graduates for any one year are designated as Honor Graduates.

Counseling, Washback and Elimination

If you fail a test the instructor or instructor supervisor will discuss the failure with you and will counsel you on the actions that can be taken. In these counseling sessions keep in mind that the instructor or supervisor is interested in your problems. He has nothing against you and is only trying to get at the cause of the problems and identify the area where you are having difficulty.

If you, the instructor, and the supervisor feel that you are able to do the work which you did not pass, the instructor may recommend you for the retest. Prior to re-testing, you will be given remedial (extra) instruction outside of normal class hours. After completion of the remedial instruction you will be retested and if you pass you will be given the minimum passing score for the block of instruction you are in.

If you should fail your retest, you may be considered for elimination in your best interest or in the best interest of the Air Force.

Special Individual Assistance

Special Individual Assistance (remedial instruction) is available to provide additional aid to students having difficulty in learning the [illegible] material.

The classroom instructor will work with you to set the time, dates, and location of your remedial instruction. You will be assisted during this study time by an instructor, or instructors by going over those subject areas that are causing the most difficulty.

Proficiency Advancement

Due to the length and nature of this course, a proficiency advancement program is not offered.

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Responsibilities of the Student

Conduct

Horseplay will not be tolerated. Your idea of fun may result in personal injury to yourself or another individual. Profanity (this is defined as conduct unbecoming) will be avoided at all times. Technically you are an adult and should act accordingly. Military bearing and conduct are a responsiblity which you must maintain during your service career. A professional Airman sets examples and is noted by his superiors accordingly.

Appearance

You are a member of the United States Air Force. As a part of this organization, as with any other, there are personal standards that you must maintain. A sharp Airman does not have to be told to get a hair cut or that his shoes need to be shined. Uniforms will be clean, neat, and serviceable. Combs, pencils, and unbuttoned uniforms will not be tolerated. Discrepancies for uniform violations will result in the instructor completing an ATC Form 41 on an individual and repeated violators will be punished under Air Force Regulation 35-10.

Cleanup Responsibilities

All areas of instruction must be kept clean; therefore, it will be your responsibility to perform the cleanup assigned. During your tour in the course, your instructor will show you where all cleaning supplies and utilities are located. The authorized cleanup time is the 10 minutes just prior to dismissal. To do a good job, cooperation and expediency are mandatory of all personnel.

TDY Personnel In and Out Processing

Morning shift personnel (0600-1200 or 0600-1500)-if your arrival is after normal duty hours on the day prior to class, report to class and then complete in-processing prior to the start of the second class day. The instructor will then retain your checklist until the day prior to graduation. you are required to turn-in the STTC Form 120 the last class day. You will not be given a diploma until your instructor has received the completed form.

Temporary Duty

AIR NATIONAL GUARD AND RESERVE STUDENTS: Requirements make it necessary that on the first day of school you furnish two sets of military travel orders to the instructor. In the event you are short on the number of special orders in your possession, go to Customer Service located in Building 402. They will assist you in obtaining additional copies at no expense.

Departure From Training

A TDY military or civilian who abandons his or her training mission prior to completion for personal reasons will be responsible for part or all of the travel and living expenses.

Energy Conservation

While you are at Sheppard AFB, we ask that you help us conserve energy. When lights are not being used, please turn them off. Do not allow water to run unnecessarily. Anytime we can save energy we are saving the Air Force money.

General Safety

Safety precautions will be observed and adhered to at ALL TIMES.

Security

OPSEC is not like other Security Programs. You have learned that communication is a must for doing any job and security of communication has to be done by everyone. COMSEC and OPSEC are not the same, but they are similar and they cannot be kept apart. A trained agent can take bits and pieces of information and put it into a useful pack of information for an enemy to make plans for attack. Information is kept from the public only in the interest of the security of the nation. The security system we use is made by an order of the President. The total security is the sum of the way each person carries out good security practices. Physical security is about threats of damage to any type of Air Force property at each of its bases. It will be the duty of the Security Police or the individuals who use the property to provide for the physical security of Air Force property.

SUMMARY

You are enrolled in the Carpentry Specialist Course, a twenty-seven day course designed to teach you the basic skills and knowledge needed in the carpentry career field. During this course you will be tested by progress checks and written block tests to ensure you are learning what the carpentry shop supervisors in the Air Force expect you to know when you complete this course and are assigned to their shops. If you fail a progress check, your instructor will bring you back to school in the afternoons for Special Individual Assistance (SIA) during which time the instructor will tutor you on the areas you failed and readminister the progress check. As a student, you can request SIA any time you feel you are having difficuties in an area of instruction. If your final grade average falls in the top ten percentile of the grades for carpentry students for the past twelve months, you will receive the honor status of being an honor student. Honor students get a special graduation certificate and an honor student key ring. You should establish good study habits (such as those recommended in the Study Skills booklet you were given upon arrival for your first class) and set a goal to be an honor student.

While attending this course you will be instructed in all aspects of safety pertaining to the carpentry career field. You will be expected to follow all safety precautions both in the classroom and in the work areas. Should you need to report a fire, the standard number for all Air Force installations is 117. Your instructor has shown you the fire evacuation procedures and has told you where shelter area is in case of a tornado or a disaster.

Your Training Center is interested in your ideas concerning ways we can improve the Carpentry Specialist Course. Student critique forms are posted in each classroom. Feel free to complete one any time. Your class will complete a Class Critique during Day 26 of your training.

You are to support the Air Force effort to conserve energy by ensuring the lights in your classroom are turned off when you leave the classroom. We also want you to support the Air Force fraud, waste, and abuse progream. Use your materials and equipment efficiently and correctly. If you see fraud, waste, or abuse, report it.

You have been given instructional materials, such as Study Guides, Workbooks, Directed Study Assignment sheets, and textbooks. Take care of them. The Study Guides and Directed Study Assignments sheets are yours to keep. Read them and do the assignments indicated. Feel free to mark in them. The textbooks are yours ONLY until your assignments in these books are completed. Do not mark in them. You must return them to your instructor. You will have to pay for damaged or lost books. The workbooks contain Progress Checks. They will be given to you only for completing the progress checks and will be returned to your instructor as each progress check is completed. Progress Checks are CONTROLLED ITEMS. Do not remove them from the classroom or work area where you are assigned to complete the progress check.

TDY students must provide their instructor with two copies of their orders. TDY students will not be given graduation diplomas until they have furnished a completed STTC Form 120, Processing Checklist - TDY Personnel, to their instructor.

All students must comform to the Professional Conduct and Relationships outlined in ATCR 30-4.

QUESTIONS

1. How many blocks of instruction are there in this course?

2. What are two purposes of the daily quizzes?

3. What is the standard telephone number to report a fire?

4. What is the building number you are to go to in the event of a disaster warning?

5. How many semester hours of credit does the Community College of the Air Force award for this course?

REFERENCES

AFR 123-2, Air Force Fraud, Waste and Abuse (FW&A) Prevention and Detection
ATCR 52-3, Student Measurement
ATCR 52-11, Student Training Records and Recognition Program
ATCR 52-26, Student Scheduling and Administration
ATCR 52-29, Student Critique Program

TECHNICAL PUBLICATIONS

OBJECTIVE

a. Given AFR 0-2, locate standard publication numbers and titles in the numercial index. Seven of ten responses must be correct.

b. Given commercial publications and a list of carpentry tools and equipment, locate desired information in the commercial publication. Eleven of fifteen responses must be correct.

c. Given AFR 85-1, AFM 85-4, and AFP 85-1, locate desired information in the publications. Five of seven responses must be correct.

INTRODUCTION

A Master Publications library is authorized at base level by AFR 5-31. This library will include many types of publications issued by the base or higher authority. AFRs, AFMs, and AFPs that are issued by higher authority and apply to the base will be included. AFR 5-1 establishes the various categories and type of Air Force publications and explains their use.

A base organization may, upon approval of higher authorities, have its own publications file. However, due to the great expense connected with the AF publications system, only a minimum number of functional libraries and individual sets are authorized.

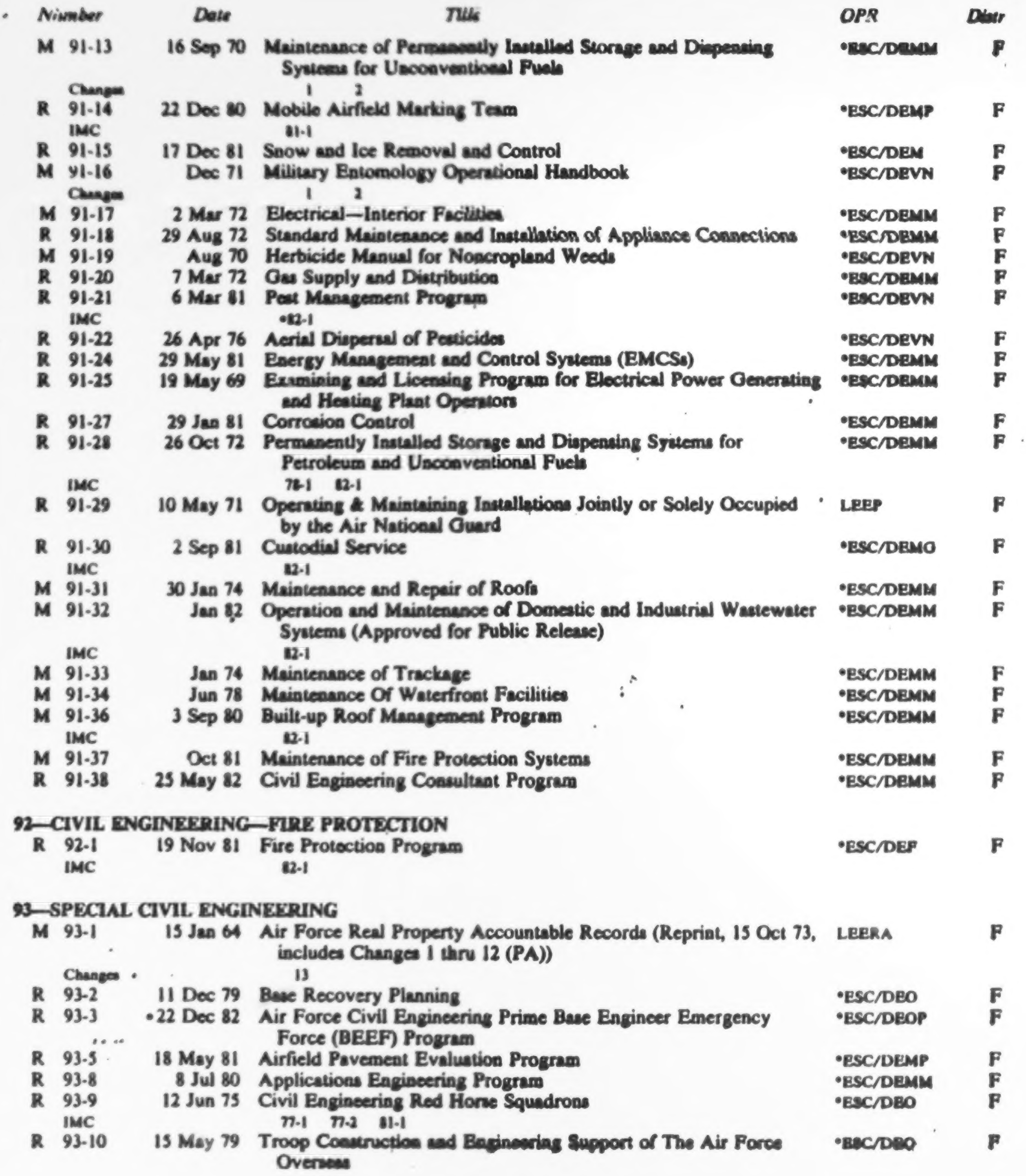
INFORMATION

INDEXING AND CATEGORIZING AFRs, AFMs, and AFPs

AFR 0-2 is the Numerical Index of Standard and Recurring Air Force Publications. Note that the "0" in 0-2 denotes that the publication is an index. Figure 2 shows the way Air Force Manuals are listed in AFR 0-2 under series or category numbers. Figure 3 shows the subject index found on page 2 of AFR 0-2. Notice that the subject index is an alphabetical index of subjects you may need to locate in AFR 0-2.

Some publication series numbers and subjects for AFRs, AFMs, and AFPs are as follows:

1- Aerospace Doctrine
5- Publications Management
9- Forms Management
10- Administrative Communications
11- Administrative Practices
34- Personnel Services
35- Military Personnel
50- Training
66- Equipment Maintenance
85- Civil Engineering - General
127- Safety
205- Security



Number	Date	Title	OPR	Distr
M 91-13	16 Sep 70	Maintenance of Permanently Installed Storage and Dispensing Systems for Unconventional Fuels	*ESC/DEMM	F
Changes		1 2		
R 91-14	22 Dec 80	Mobile Airfield Marking Team	*ESC/DEMP	F
IMC		81-1		
R 91-15	17 Dec 81	Snow and Ice Removal and Control	*ESC/DEM	F
M 91-16	Dec 71	Military Entomology Operational Handbook	*ESC/DEVN	F
Changes		1 2		
M 91-17	2 Mar 72	Electrical—Interior Facilities	*ESC/DEMM	F
R 91-18	29 Aug 72	Standard Maintenance and Installation of Appliance Connections	*ESC/DEMM	F
M 91-19	Aug 70	Herbicide Manual for Noncropland Weeds	*ESC/DEVN	F
R 91-20	7 Mar 72	Gas Supply and Distribution	*ESC/DEMM	F
R 91-21	6 Mar 81	Pest Management Program	*ESC/DEVN	F
IMC		•82-1		
R 91-22	26 Apr 76	Aerial Dispersal of Pesticides	*ESC/DEVN	F
R 91-24	29 May 81	Energy Management and Control Systems (EMCSs)	*ESC/DEMM	F
R 91-25	19 May 69	Examining and Licensing Program for Electrical Power Generating and Heating Plant Operators	*ESC/DEMM	F
R 91-27	29 Jan 81	Corrosion Control	*ESC/DEMM	F
R 91-28	26 Oct 72	Permanently Installed Storage and Dispensing Systems for Petroleum and Unconventional Fuels	*ESC/DEMM	F
IMC		78-1 82-1		
R 91-29	10 May 71	Operating & Maintaining Installations Jointly or Solely Occupied by the Air National Guard	LEEP	F
R 91-30	2 Sep 81	Custodial Service	*ESC/DEMO	F
IMC		82-1		
M 91-31	30 Jan 74	Maintenance and Repair of Roofs	*ESC/DEMM	F
M 91-32	Jan 82	Operation and Maintenance of Domestic and Industrial Wastewater Systems (Approved for Public Release)	*ESC/DEMM	F
IMC		82-1		
M 91-33	Jan 74	Maintenance of Trackage	*ESC/DEMM	F
M 91-34	Jun 78	Maintenance Of Waterfront Facilities	*ESC/DEMM	F
M 91-36	3 Sep 80	Built-up Roof Management Program	*ESC/DEMM	F
IMC		82-1		
M 91-37	Oct 81	Maintenance of Fire Protection Systems	*ESC/DEMM	F
R 91-38	25 May 82	Civil Engineering Consultant Program	*ESC/DEMM	F

92—CIVIL ENGINEERING—FIRE PROTECTION

Number	Date	Title	OPR	Distr
R 92-1	19 Nov 81	Fire Protection Program	*ESC/DEF	F
IMC		82-1		

93—SPECIAL CIVIL ENGINEERING

Number	Date	Title	OPR	Distr
M 93-1	15 Jan 64	Air Force Real Property Accountable Records (Reprint, 15 Oct 73, includes Changes 1 thru 12 (PA))	LEERA	F
Changes		13		
R 93-2	11 Dec 79	Base Recovery Planning	*ESC/DEO	F
R 93-3	•22 Dec 82	Air Force Civil Engineering Prime Base Engineer Emergency Force (BEEF) Program	*ESC/DEOP	F
R 93-5	18 May 81	Airfield Pavement Evaluation Program	*ESC/DEMP	F
R 93-8	8 Jul 80	Applications Engineering Program	*ESC/DEMM	F
R 93-9	12 Jun 75	Civil Engineering Red Horse Squadrons	*ESC/DEO	F
IMC		77-1 77-2 81-1		
R 93-10	15 May 79	Troop Construction and Engineering Support of The Air Force Overseas	*ESC/DEO	F

Figure 2. Typical page from AFR 0-2

Subject	No.
Accounting and Finance	177
Acquisition Management	800
Administration Management	4
Administrative Communications	10
Administrative Practices	11
Aeromedical Evacuation	164
Aerospace Basic Doctrine	1
Aerospace Medicine	161
Aerospace Operational Doctrine	2
Aerospace Systems Security	207
Air Base Defense	206
Antiterrorism	208
Armament	136
Audiovisual Systems	95
Auditing	175
Automatic Data Processing Systems and Procedures	171
Awards, Ceremonies, and Honors	900
Budget	172
Chaplain	265
Civil Air Patrol	46
Civil Engineering—Fire Protection	92
Civil Engineering—General	85
Civil Engineering—Programming	86
Civilian Personnel	40
Claims	112
Command and Control and Communications	102
Commissaries	145
Communications-Electronics	100
Comptroller	170
Contracting and Acquisition	70
Contractor Data Management	310
Cost Analysis	173
Courier Administration and Operations	183
Data Automation	300
Dental Services	162
Dependents' Education	214
Designating and Naming Defense Equipment	82
Disaster Preparedness	355
Documentation	12
Education Services Program	213
Electronics Systems	101
Energy Conservation	18
Enlisted Personnel	39
Environmental Planning	19
Equipment Maintenance	66
Exchange Service	147
Facility Construction	89
Facility Design and Planning	88
Federal Supply Cataloging	72
Flying	60
Flying Training	51
Food Service	146
Forms Management	9
Fuels, Propellants and Chemicals	144
Graves Registration and Mortuary Affairs	143
Historical Data and Properties	210
Housekeeping and Nonhousekeeping Quarters	140
Housing	90
Indexes	0
Industrial Resources	78
Inspection	123
Inspector General	120
Intelligence	200
Judge Advocate General	110
Laundry and Dry Cleaning	148
Libraries	212
Logistics	400
Maintenance-Engineering and Supply	65
Management Analysis	178
Management Engineering	25
Manpower	26
Mapping, Charting, and Geodesy	96
Materiel Programming	401
Medical Administration	168
Medical Education and Research	169
Medical Food Service	166
Medical Materiel	167
Medical Service	160
Military Airlift	76
Military Justice	111
Military Personnel	35
Military Personnel Procurement	33
Military Records	31
Mission Employment Tactics	3
Morale, Welfare, and Recreation	215
Motor Vehicles	77
Natural Resources	126
Nonappropriated Funds	176
Nuclear Surety	122
Officer Personnel	36
Operational Requirements	57
Operations	55
Organization and Mission—Departmental	21
Organization and Mission—Field	23
Organization and Mission—General	20
Oversea Areas	216
Packaging and Materials Handling	71
Personal Affairs	211
Personnel	30
Personnel Services	34
Postal Operations and Official Mail Management	182
Production	84
Programming	27
Public Affairs	190
Publications and Forms Distribution Management	7
Publications Management	5
Quality and Reliability Assurance	74
Real Property Management	87
Real Property Operation and Maintenance	91
Reprographics	6
Research and Development	80
Reserve Forces	45
Safety	127
Schools	53
Search and Rescue	64
Security	205
Security Police	125
Special Civil Engineering	93
Special Investigations	124
Special Publications Systems	8
Specifications and Standards	81
Standardization	73
Storage and Warehousing	69
Supply	67
Technical Training	52
Training	50
Transportation and Traffic Management	75
Value Engineering	320
Veterinary Service	163
War Planning	28
Weather	105
Writing Improvement	13

Figure 3. Alphabetical list of subjects

AIR FORCE REGULATIONS

Air Force Regulations announce policies, assign responsibilities, direct actions, and when necessary, prescribe brief procedural details. Regulations are permanent directives and apply to all Air Force military and civilian personnel.

Note that page 2-2 of AFR 0-2 is an alphabetical listing by subject. This is shown on study guide, page 2-3, figure 3.

AIR FORCE MANUALS

An Air Force Manual may be general in content and deal with principles of doctrine, it may be a compilation of material related to an entire function, or it may be a step-by-step directive on the accomplishment of an operation. Air Force Manuals are also indexed in AFR 0-2. Manuals tell you how to do a job.

Manuals are used for the same purpose as regulations and often have similar appearance, volume, scope, and applicability. Because they have no unique characteristics to distinguish them from regulations, manuals are redesignated as regulations as they are revised. New manuals are not being published except those that support automated data systems.

Manuals are also issued to support specific training requirements and to disseminate study and reference materials.

Examples of a few AFMs pertinent to technical fields are as follows:

AFM 50-5 USAF Formal Schools Catalog
AFM 66-18 Engineering and Technical Services Management and Control
AFM 85-3 Paint and Protective Coatings
AFM 85-42 Carpentry Handbook
AFM 126-2 Natural Resources - Land Management

There are many manuals, called Field Publications, written and published at a Major Air Force Command level or lower that are not mentioned in this text. These manuals pertain only to a specific Air Force command and cannot be satisfactorily taught in a course of this type. Upon being assigned to a major command (SAC, TAC, MAC, etc.) you should become familiar with the command publications applicable to your job.

AIR FORCE PAMPHLETS

Pamphlets usually contain informative rather than directive material. They are usually issued as a brochure or booklet and may be written in an informal style. They are permanent in nature, but when practical, an expiration clause may be included.

Examples of a few AFPs pertaining to technical fields are as follows:

AFP 50-66 USAF Aerobics Physical Fitness Program
AFP 85-1 Electrical Facilities Safe Practice Handbook
AFP 88-41 Interior Design

INDEXES TO AIR FORCE PUBLICATIONS

The methods of procurement and the various distributions codes established for AF forms, regulations, manuals, and pamphlets are thoroughly explained in AFR 7-1, "Receiving Distributing, Requisitioning, and Warehousing Publications and Forms." This procurement action is primarily the task of administrative personnel. Usually, if you can identify the publications you need, and can justify your need for them, your administrative section will be able to get them for you. A publications bulletin is issued bi-weekly to advise on the availability of publications and forms distributed by the AF Publications Distribution Center.

The most important thing to you as a technical specialist is to know where the publications are indexed and to become familiar with these indexes. Indexes of interest to you are outlined in the following subtopics.

AFR 0-2, Numerical Index of Standard and Recurring Air Force Publications

This index contains a numerical listing of published Air Force manuals, pamphlets, regulations, recurring publications, and visual aids.

Publications are listed numerically by series, from Series 1, Aerospace Doctrine, to Series 900, Awards, Ceremonies, and Honors. Within this listing are publications of interest to technical specialists. Some of these are: Series 127, Safety; Series 39, Military Personnel; Series 50, Training; Series 85, Civil Engineering - General; and many more.

Air Force publications are filed numerically just as they are listed in AFR 0-2.

AFR 0-8, Numerical Index of Specialty Training Standards

This numerical index provides a listing of all published Specialty Training Standards. It is useful in determining what is available to assist you in training and also enables you to determine if the publications you have are current documents.

If you identify needed materials in the 0-8, your administrative NCO can assist you in getting them. Normally, publications listed in this index are controlled by the Base OJT Office.

AFR 0-9, Numerical Index of Departmental Forms

The 0-9 index lists, in numerical order, Air Force (AF) forms, Air Force Technical Order (AFTO) forms, Department of Defense (DD) forms, and others. This index provides the current date for each form listed and also lists the prescribing directive which provides information on the use of the form.

AFR 0-10, Management Control and Authorization Program for Tables of Allowance and Allowance Source Codes for USAF Activities.

This index lists Table of Allowance publications which are of interest to personnel in obtaining the equipment and tools necessary to support the operation of an organization. The AFR 0-10 is a document you may not use often, but you should know that it is available in your organization's regulation file. Also, it is a rather complicated looking publication to persons who are not familiar with the format. For this reason, you should make it a point to ask your supervisor to explain it to you when you are assigned to an operational activity.

Other Air Force Publications Indexes

There are other indexes and publications (many others) in addition to those outlined above; however, the above are the ones most useful to you. Visit your maintenance administrative section and become familiar with the publications listed. You will find that personnel in the administrative career field have a good knowledge of the various publications systems and will always be able to assist you in locating and obtaining the publications needed.

SECURITY CLASSIFICATION OF AFMs

Normally, classified AF manuals are not published; however, they may be published as confidential if the distribution is strictly controlled and limited in accordance with AFR 205-1, Information Security Program. As an exception, the Chief of a major staff office or the Commander of a major air command may issue a secret manual.

SUMMARY

Air Force Regulations announce policies, assign responsibilities, and direct actions.

Air Force Manuals contain permanent and detailed instructions, procedures, and techniques that enable personnel to perform their duties.

Air Force Pamphlets usually contain informative, [illegible] material. However, some are directive, as in the case of [illegible].

Air Force Manuals, Pamphlets, and Regulations are indexed in AFR 0-2 along with Recurring Periodicals and Visual Aids.

A Publications Bulletin is issued bi-weekly to advise on the availability of publications and forms distributed by the AF Publications Distribution Center.

To be of maximum value to your organization and the Air Force, you should make a great effort to keep current on new publications and changes to publications pertaining to you and your organization. You should especially review new indexes frequently for the purpose of identifiying new publications which will assist you in your work.

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COMMERCIAL PUBLICATIONS

Commercial publications are written and published by the equipment manufacturers. Occassionally you use these publications when you are working with equipment for which an Air Force technical order has not been published. Commercial publications are usually in manual, booklet, or pamphlet form, and contain technical information on assembly, installation, operation, servicing, overhaul, and parts identification.

When necessary, commercial publications are assigned TO numbers and integrated into the technical order system. In addition to carrying TO numbers, commercial publications that have been integrated into the Air Force technical order system are listed in appropriate Numerical Index Technical Orders and Publications Requirements Tables. Commercial publications that are packed with delivered equipment and identified by the manufacturer as "interim data" are authorized for temporary Air Force use only until published technical orders become available.

The carpentry shop in which you will work will probably have a file of booklets, manuals, and pamphlets that have been provided by the manufacturer of the equipment in the shop. These publications will provide information on the operation and maintenance of each piece of equipment. You should never attempt to operate a power tool with which you are not familiar, nor should you make any repairs without first reading the manufacturer's manual, for that tool.

Commercial publications may also include catalogs from which tools, parts for equipment, or supplies may be ordered. It is important, when ordering from a catalog or manufacturer's parts list, to insure that you have the correct stock number. It is also important, in order to save time when looking for specific information to first look in the general index.

QUESTIONS

1. Which numerical index lists Air Force Manuals and Pamphlets?

2. What type information is contained in Air Force Manuals?

3. What type information is normally contained in Air Force Pamphlets?

4. Which section of your organization will assist you in obtaining the publications you require?

5. What type publications are indexed in AFR 0-2?

6. What type publications are indexed in AFR 0-9?

7. Who is the first person you should contact when you need technical publications or information?

REFERENCES

AFR 5-1, Air Force Publications Management Program
AFR 7-1, Receiving, Distributing, Requisitioning, and Warehousing Publications and Forms
AFR 7-2, Procedural Guide for Customers of the Publications Distribution Officer
AFR 0-2, Numerical Index of Standard and Recurring Air Force Publications
AFR 5-4, Numbering Publications
AFR 5-31, Publications Libraries and Sets

SAFETY

OBJECTIVES

a. Given situations involving electrical hazards, analyze the hazard and explain the required safety precautions.

b. Given incomplete statements specify safety procedures for working with products containing asbestos fibers.

c. Given incomplete statements specify procedures used in identification, reporting, and correcting safety hazards.

d. Given a situation involving a safety hazard and AF Form 457, report the hazard by completing the AF Form 457 with no more than two instructor assists.

e. Given incomplete statements, identify requirements for hazardous waste storage by completing the statements.

INTRODUCTION

As an Air Force specialist or technician, you should have two primary goals in life: one, to do a first-class job in your assigned duty; the other, to return to civilian life, either by discharge or retirement, in as good physical condition as possible. A thorough knowledge of the hazards confronting you, the established safety rules to protect you, and your observance of these safety rules, may determine what condition you will be in when you return to civilian life. In fact, it could determine whether or not you live long enough to become a civilian again.

INFORMATION

GENERAL GROUND SAFETY

General items of safety apply to just about all duty assignments within the Air Force. To help you become more aware of the need for proper safety practices, and to help you survive in a challenging world, important information is presented in the following topics of this section:

- ACCIDENT CAUSES
- WORK AREA SAFETY PRACTICES
- STORAGE OF MATERIALS

Accident Causes

A standard dictionary defines the word "accident" or "accidental" as, "An event that takes place without one's foresight or expectation." This definition indicates that with adequate foresight, most of our accidents can be prevented. (They can.) Refer to figure 4 for a graphic representation of the underlying causes of accidents.

Often when another person is involved in an accident of one kind or another, we can readily see how he could have avoided it. This is because there are certain things or conditions which cause accidents. All we must do to prevent most accidents is to be able to recognize the causes and apply the appropriate preventive measures. The following topics wil present some common causes of accidents and the action to take to eliminate these causes.

Accident Prevention Methods

There are three principal methods used for accident prevention. They are physical modification, education and training, and enforcement of safety standards

Physical Modification.

ACCIDENTS ARE PREVENTABLE. They do not happen without a cause. If you can identify and eliminate the cause, you eliminate the accident. The first method of accident prevention is called physical modification. Suppose you are painting a building and you are using a scaffold without safety

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railing. It may be 2 days before the job is complete. If you have the safety rails off, someone could fall from the scaffold and be injured. Other examples of physical modification include additions of machine guards, handrails and walk boards.

Education and Training.

A second method of preventing accidents is education and training. This is an effective means of preventing unsafe acts by individuals. Through adequate instruction, personnel gain useful knowledge and develop safety attitudes. Safety education and training may be demonstrated to people by placing safety suggestions on the bulletin board, passing safety literature to each worker on a weekly basis, training in a group situation, using movies and slides in a classroom, and self-study using Air Force and commercial publications. Safety consciousness developed through education should be supplemented and broadened by training on specific machines in using certain skills. Training gives each person a safety tool by developing in the worker habits of safe practice and operation.

Enforcement of Safety Standards.

The third method of preventing accidents is by enforcement of safety standards. Some people are a hazard to themselves and others because of their failure to comply with accepted safety standards. For these persons strict enforcement of safety practices is necessary. People who like to drive 80 miles per hour when traffic laws call for 55 are in trouble. Either they will be given tickets for speeding by the law enforcement officers until their license is revoked, or they will end up in a traffic accident in which they themselves and others are injured, or their vehicle is damaged, or both. Each supervisor is responsible for enforcing safety standards and regulations. A supervisor is responsible to assure that the people work safely. If supervisors do not enforce directives, they are condoning conduct that leads to accidents.

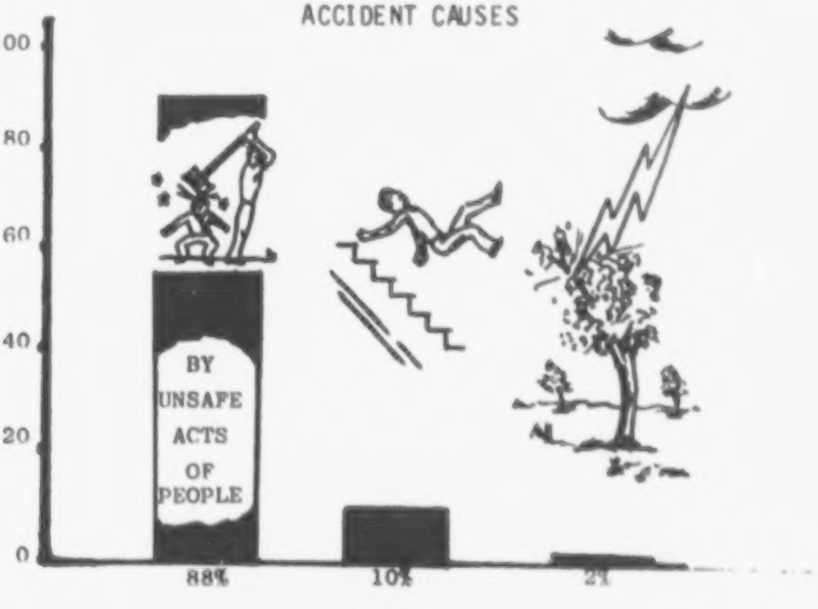


Figure 4. Causes of Accidents

WORK AREA SAFETY PRACTICES

Your work area may contain many potential hazards if you fail to follow the safety rules established for your protection. The following paragraphs will make you aware of some of the things you should, or shouldn't do, to perform your job safely.

Housekeeping

Poor housekeeping, that is not keeping your work area clean and neat, could result in various types of accidents both of a major and or minor nature. Broken bones, cuts, gouges, burises, burns, and other injuries can stem from poor housekeeping. To stop these and countless other injuries is to practice good housekeeping. Some of the more important items for you to consider in keeping your work area, and also your living area, in proper order are given below.

- Keep all floors and walkways clean, dry, and free of oil, fuel, or grease. If fuel, oil, or grease is spilled, clean it up as soon as possible. To slip or fall could cause a serious injury to you or someone else.
- Be sure that your shop or work area is well ventilated at all times. Vapors from fuels, oils, greases, and various types of acids are a threat to your health.
- Keep the work area well lighted when at all possible. You cannot work efficiently and safely without good lighting. Check the lighting system frequently and replace burned-out lamps, fuses, and do other preventive maintenance as required.
- Don't leave tools scattered about on floors, workstands, or any other place. When not in use, tools should be placed in those cabinets and boxes that were made for your tools. Some tools used in your job are heavy enough to cause much damage should they fall even a short distance.
- Don't pick up a toolbox which is too heavy to handle. Workers have been known to rupture themselves in handling excessively heavy loads. Place your tools in separate boxes so that you can handle them without strain.
- Don't clutter your work area with unnecessary equipment. If you do not intend to use a took, store it in a safe place.
- Keep all ropes, chains, hoists, hoses, and electrical extension cords properly stowed when not in use.
- Have on hand suitable containers for waste and see that waste is promptly put into the proper container. Mark each container for the material it is to be used for.

- Use extra care in disposing of scrap metal, wire, glass, etc. Make sure that all parts of the materials are well inside the waste container. The sharp edges of these materials will cut and tear your skin as well as your clothes.

- Keep a good inspection program of all electrical cables, switchgear, and equipment for frayed wiring insulation, exposed contacts, and condition of switch handles and other controls.

- Check your shop frequently for protruding nails, bolt ends, and other sharp points which may cause injury. Also, be sure that a broken window or door glass is replaced promptly and the broken glass properly disposed of.

- Be sure that water fountains, lunch areas, and clothes lockers are kept in a clean, sanitary condition. Illness caused by contaminated water, food, coffee, etc., can often become more serious than most accidents.

The above listed housekeeping items are not the only things for you to consider, but they will help you to improve your housekeeping.

Horseplay

Some of the common varieties of horseplay are pushing, tripping, directing compressed air toward a friend, shocking a friend with electricity, applying the hotfoot, and perhaps the worst of all, goosing. This goosing, if applied to a nervous person, may cause him to leap into moving machinery or into contact with high voltage electricity, or he may simply fall and "only" break an arm. Injuries or deaths resulting from horseplay cannot be justified. Horseplay in any Air Force shop is forbidden.

LADDERS

It is important for the carpenter to know how to select, erect, use and care for ladders to reach an area that cannot be reached from the ground. When you erect and use a ladder, the most important consideration is safety.

In the construction field, there are numerous serious accidents caused by ladders that are not erected or used properly. A ladder improperly erected or used incorrectly not only endangers the worker using it, but it could be a death trap for workers under or near it.

Selection of Ladders

Ladders are devices used to gain access to higher levels where work is to be done. The most common types of ladders that you will be using are the single ladder, extension ladders, and the stepladder.

The single ladder used by the carpenter consists of two side rails from 8 to 26 feet in length with rungs (steps) 12 inches apart. A quality ladder will support weights up to 500 pounds. The size of a ladder is determined by its overall length. Figure 5 shows a typical single wooden ladder.

The extension ladder, as shown in Figure 6 consists of two or more sections. These sections overlap and can be extended by pulling the rope. They are locked in position by the safety latch. Some extension ladders are extended by pushing the top ladder through steel guides on the bottom ladder. These extension ladders are called push-up ladders.

A stepladder is a type of ladder that is self-supporting. Figure 7 shows a sturdy stepladder. The rungs or steps should be reinforced with a steel rod running through the side rails. Be sure it is equipped with a steel spreader locking device.

Erection of Ladders

Erect a ladder by placing the base against the foundation or a solid base. Raise the top end and walk under the ladder toward the base. As soon as the ladder is perpendicular, pull the bottom out from the building to a distance of 1/4 of its length, as shown in Figure 8. If you must get on top of the building or on a scaffold, the ladder must extend at least 36 inches, as shown in Figure 8.

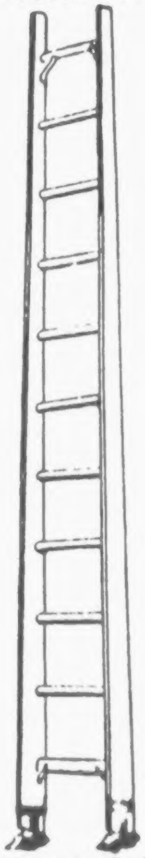


Figure 5.
Single Ladder

Erect extension ladders in the collapsed position. After you erect the ladder, lean the top away from the building and raise it to the desired height with the pully-and-rope arrangement. Extension ladders must overlap to hold the sections together. The sections should overlap at least 3 feet for a ladder up to 38 feet, 4 feet up to 45 feet, and 5 feet for ladders over 45 feet. The sections are held secure with a locking device, as shown in Figure 6. Get help when erecting long, heavy ladders.

Step ladders are erected by spreading the legs and operating the locking spreader to keep the legs from folding. Be sure the ladder is on level footing.

Care of Ladders

Inspect ladders for defects and discard them if any defect has developed. When it is necessary for you to carry a ladder, carry it over your shoulder with the front end elevated, as shown in Figure 6. Do not drop it or allow it to fall, as the impact will weaken it. Store the ladder horizontally on hangers to prevent sagging, as shown in Figure 10. Do not store near heat or expose it to the weather elements.

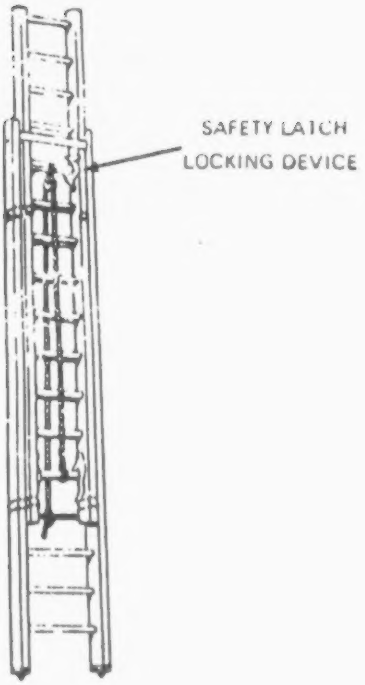


Figure 6. Extension Ladder

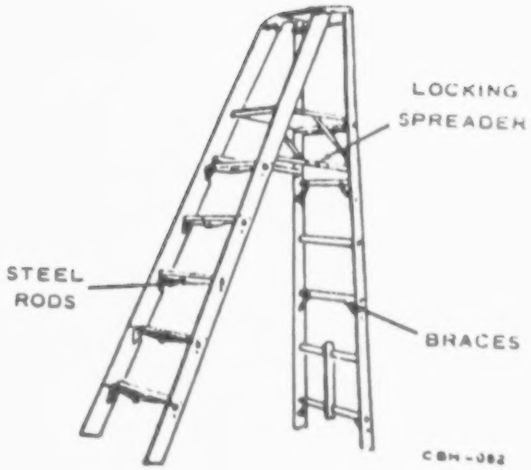


Figure 7. Stepladder

Ladder Safety

Some safety precautions that you must observe when using a ladder are as follows:

a. Always inspect a ladder before using it.

b. Before climbing the ladder, be sure that both rails rest on solid footing.

c. Equip the rails with safety shoes, as shown in Figure 11. This is especially necessary when you use the ladder on surfaces that could permit the ladder to slip.

d. Never leave a ladder unattended for any length of time while it is erected-take it down and lay it on the ground.

e. When working on a ladder stand no higher than the third rung from the top and do not attempt to reach beyond a normal arm's length.

f. If you need help to do the work, have your helper get another ladder -- don't allow anyone on the ladder with you.

g. Never climb a ladder while using both hands to hold material; at least one hand must be used on the ladder while climbing or descending it.

h. Never place either the top or the bottom of a ladder against unstable material.

i. When working on a ladder stand no higher than the third rung from the top and do not attempt to reach beyond a normal arm's length.

j. If you need help to do the work, have your helper get another ladder -- don't allow anyone on the ladder with you.

k. Never climb a ladder while using both hands to hold material; at least one hand must be used on the ladder while climbing or descending it.

l. Never place either the top or the bottom of a ladder against unstable material.

It is important for the carpenter to know safety precautions while performing the duties of his job. Many accidents are prevented by workmen knowing safe and unsafe practices.

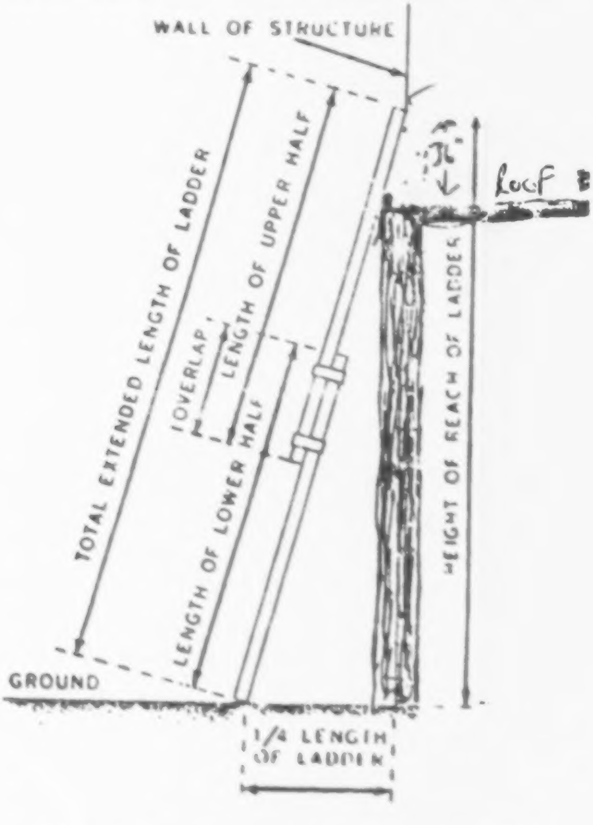

WALL OF STRUCTURE
3'
Roof
TOTAL EXTENDED LENGTH OF LADDER
LENGTH OF UPPER HALF
OVERLAP
LENGTH OF LOWER HALF
HEIGHT OF REACH OF LADDER
GROUND
1/4 LENGTH OF LADDER

Figure 8. A Properly Placed Ladder

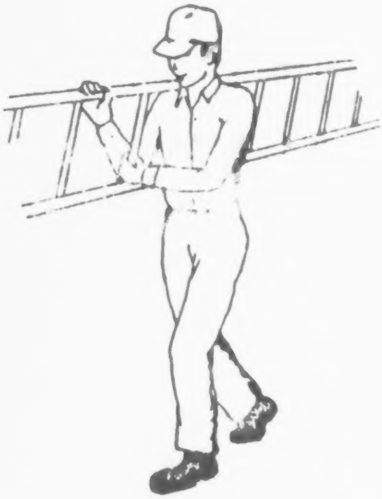


Figure 9. Carrying a Ladder

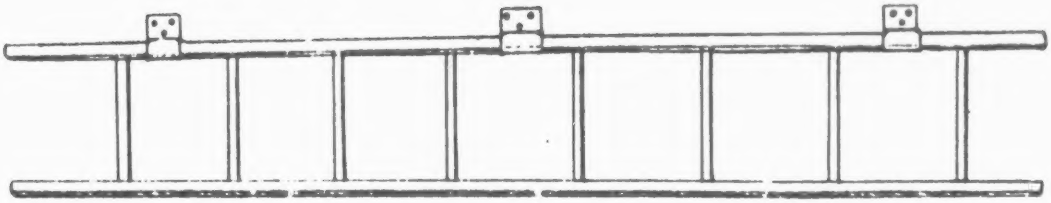


Figure 10. Storing a Ladder

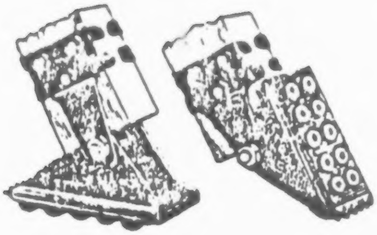


Figure 11. Ladder Safety Shoes

SCAFFOLD SAFETY

A large part of your work will be done from a scaffold. Serious accidents have been caused by carpenters using scaffolds which were erected or used improperly. A scaffold which has been erected improperly not only endangers the workers using it, but could become a serious danger to people who work near it. The following safety precautions for the scaffold horse, sectional steel scaffold, and the aluminum stairway scaffold are not all-inclusive and are not designed to replace other safety precautionary measures.

Scaffold Horse.

Although scaffolds constructed by using scaffold horses are not very high from the ground. There are several precautions to take to prevent serious injury to yourself or others. Some of the precautions to take are as follows:

1. Inspect the scaffold horses for split members, loose knots, and bad nailing.
2. Set the scaffold horses on firm even footing for each leg.
3. Test scaffold boards before using by jumping on them, as shown in figure 12.
4. Never use a scaffold board for masonry work that is not a minimum size of 1 1/2 x 9 1/2 (2 x 10).
5. Place the boards close together on the horses.
6. Do not overload the scaffold.

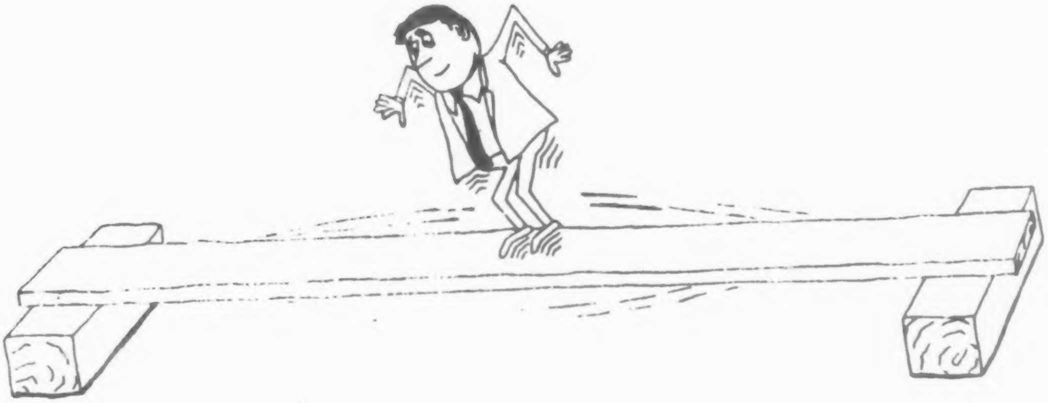


Figure 12. Testing a Scaffold Board

Sectional Steel Scaffold

The sectional steel scaffold is the safest scaffold for a carpenter to use. It will hold heavy loads when it is necessary. Some safety precautions to take while working from the sectional steel scaffold are as follows:

1. Inspect all scaffolds before using--never use any equipment that is damaged or deteriorated in any way.
2. Keep all equipment in good repair. Avoid using rusted equipment---the strength of rusted equipment is not known.
3. Inspect erected scaffolds regularly to be sure that they are maintained in safe condition.
4. Provide adequate support for scaffold posts and use base plates.
5. Use leveling jacks instead of blocking to adjust to uneven grade conditions.
6. Plumb and level all scaffolds as the erection proceeds. Do not force braces to fit--level the scaffold until a proper fit can be made easily.
7. Fasten all braces securely.
8. Do not climb cross braces.
9. On wall scaffolds place and maintain tie-ins securely between structure and scaffold at least every 30 feet of length and each 26 feet in height.
10. Equip all planked or staged areas with proper guardrails and toeboards.
11. Do not erect steel scaffolds near power lines.
12. Do not use ladders or makeshift devices on top of scaffolds to increase the height.
13. Do not overload scaffolds.
14. Use only lumber that is properly inspected and graded as scaffold plank.
15. Planking must have at least 12 inches of overlap and extend 6 inches beyond center of support, or be cleated at both ends to prevent sliding off supports.
16. Do not allow unsupported ends of plank to extend an unsafe distance beyond supports.

17. Secure plank to scaffold when necessary.

18. For rolling scaffold the following additional rules apply:
    - Do not ride rolling scaffolds.
    - Remove all material and equipment from platform before moving scaffold.
    - Caster brakes must be applied at all times when scaffolds are not being moved.
    - Caster brakes must be applied at all times when scaffolds are not being moved.
    - Caster with plain stems must be attached to the panel or adjustment screw by pins or other suitable means.
    - Do not attempt to move a rolling scaffold without sufficient help--watch out for holes in floor and overhead obstructions.
    - Do not extend adjusting screws on rolling scaffolds more than 12 inches.
    - Do not use brackets on rolling scaffolds without consideration of overturning effect.
    - The working platform height of a rolling scaffold must not exceed four times the smallest base dimension unless the scaffold is guyed or otherwise stabilized.

Aluminum Stairway Scaffold

Here are some safety rules that apply to aluminum stairway scaffolds.

1. Apply all caster brakes before climbing the scaffold.
2. Never move a scaffold when anyone (or any material) is on it.
3. Be sure the scaffold is level at all times. When a leg is adjusted, be sure to push the locking collar completely over the expanding nut and below the safety locks. Never make leg adjustments when anyone is on the scaffold.
4. Don't try to "stretch" the platform height with the adjustable legs. When additional height is required, add more scaffold sections. Save the leg adjustment for leveling the scaffold.

5. Do not lean a ladder against a stairway scaffold or place a ladder on the platform of a scaffold. Never push or pull or lean against the wall or ceiling when standing or sitting on a scaffold, unless it is securely tied in to the building.

6. Make sure all locking hooks are firmly in position. These hooks appear at each end of separate horizontal and diagonal braces and at the lower end of stairways.

7. Before using a scaffold with folding braces, be sure that the latches of all locking hinges are locked.

8. Always install a safety railing and toeboard when a platform is to be used at heights of 4 feet or over.

9. When the height of an aluminum stairway scaffold platform is going to exceed three times the minimum base dimension, the scaffold must be tied in to the building.

10. Do not climb or stand on diagonal braces. Work only while standing on one of the platforms.

11. Never use a scaffold of any type in the vicinity of live electrical apparatus or near machinery that is in operation.

12. The columns of each scaffold section are furnished with interlock clips parked in the lower of a pair of holes at the upper ends. As an upper section is inserted, the interlock clips of the section below are moved to the upper section bushings, interlocking the two sections. Never erect a scaffold without interlocking the sections in this manner. If interlock clips are damaged or lost, replace them immediately.

13. Never use stairways to work from; they are for personnel to walk up and down between platforms. Stairways are designed to take the weight of a 200-pound man. They are not designed to take excessive loads or ???????.

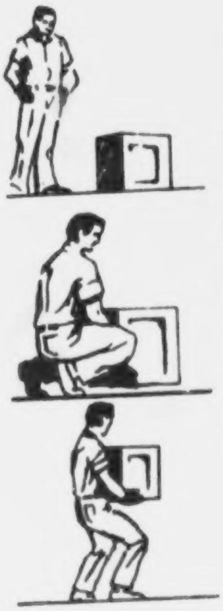
14. Never climb up the outside of a stairway scaffold. Always use the stairway for access.

15. The platform of the stairway scaffold must always be located on the floor braces by means of four locating pins. When being used outdoors or whenever the scaffold is exposed to wind or updrafts, the platform must be tied down and the scaffold secured to the building.

16. The platform of the stairway scaffold is designed to carry a maximum distributed load of 750 pounds. Do not exceed this 750-pound load.

To lift an object in the wrong way can cause serious damage to your back. Some of the factors that must be considered when establishing safe lifting limits for all workers are: physical difference of personnel, periods of sustained lifting, height of lifting, distance and frequency of load that is carried, and size and shape of the load.

You should not be assigned excessively heavy lifting duties unless a medical examination reveals that you are physically capable of performing these duties. Physical differences make it impracticable to set up lifting limits for each worker. When lifting, first make sure that your footing is secure and then grasp the object in such a way that it can be held if it becomes unbalanced. You should then lift from a squatting position with the back straight. This permits the legs to do the primary lifting force. (Refer to figure 13.)



LIFT THIS WAY

1. Check weight and size. A bulky, awkward load can cause more strain than a compact heavier one.
2. Plant your feet firmly, well apart, and squat down.
3. Watch out for sharp edges. Get a good grip.
4. Keep your back as straight as you can. Lift slowly (don't jerk) by pushing up with your legs.
5. Don't twist your body with the load. Shift your feet.

Figure 13. Safe Lifting Procedures

Each load should be carried as close to the body as possible without shifting the grip after the load has been lifted. Be sure that your view is unobstructed and the floor in the direction you are carrying the load is clear and free of slippery materials. The load should be carried by the most safe and convenient method as determined by its size, shape, and weight.

Any object too heavy to be carried easily by one person will be carried by two. If two people cannot safely carry the load, a suitable mechanical device will be used.

The improper use of common hand and power tools results in many avoidable accidents. One of the prime rules in the use of any tool is to use the right tool for the right job. Another prime rule is to keep all tools in a good state of repair. Also keep tools in their proper space so that they can be used when needed. Some important safety items to consider in the use of tools are given in the paragraphs below.

- When possible, use handtools so that the working force is always directed away from your body. This will minimize the chance of injury in case the tool should slip. One exception to this rule is the use of wrenches.
- When handles of hammers, sledges, files, and other tools become splintered or loose, replace them immediately.
- Mushroom heads on cold chisels, punches, driftpins, hammers, and other similar tools should be dressed down as soon as they begin to check and curl.
- Cutting tools should be kept sharp and kept in their proper sheaths. They should never to placed in clothing pockets.
- Box end type wrenches or sockets should be used whenever possible. They are less likely to slip than open end and other type wrenches. Another thing, if a job requires a special tool, use a special tool. To help prevent slippage, a wrench handle should be pulled, never pushed.
- Impact goggles or faceshields must be worn any time there is danger of flying chips, sparks, or other debris.
- Small parts should always be held securely in a vise while being worked on.
- Since hammers account for about one in every five handtool accidents, care must be observed in their use. Hammer handles should never to used as pry bars. punches, or chisels. Never use a file or rasp without the proper handle installed; you may drive the tang right through your hand.
- Punches and chisels should be kept clean and during use should be held firmly between the thumb and all four fingers.

There are many more safety precautions that you should heed in the use of handtools; however, the space here does not let us list them all. It is recommended that you refer to AFOSH STD 127-66, General Industrial Operations when you are on the job. Use of this handbook could save you from injuries.

The use of powered handtools requires you to observe the same precautions as for non-powered tools, plus a few additional ones. In the case of electrical tools, to keep the tools clean and in a good state of repair is of great importance. In addition to keeping the tools and electrical cords in first-rate condition, the tools should have a good ground when in use. This protects you from the danger of an electrical shock just in case a short circuit should occur in the tool. The need for a good ground is too often left out, but is it important and it should never be omitted. Another precaution is to hold an item firmly in a vise. Never hold a piece of material by hand and try to drill it with a drill. The stock may catch on the drill bit and become a rapidly spinning blade.

STORAGE OF MATERIALS

Storage. Both inside and outside storage facilities are used by the Air Force. Warehouses, storage yards, and supply dumps are all part of the storage operation. The following safety precautions will apply to personnel working in any type of storage facility. Prescribed practices will be followed to prevent hazards caused by the methods of storage and to protect the materials being stored as described in AFM 67-3 and AFR 69-8.

a. Hazardous Substances. Dangerous materials, such as flammable liquids and explosives, will be stored only according ot the specific instructions in appropriate Air Force published guidance. Ordinarily, hazardous substances will be stored in special containers in well-ventilated, fire-resistant areas. All sources of ignition will be prohibited in these storage areas. Certain other commodities, such as vegetable oils and grease, which are subject to spontaneous combustion, will be stored where they present no hazards to personnel or property.

b. Floors. Floors in warehouses will not be overloaded at any time. Safe load capacities will be established and posted in plain view of all workers.

c. Stacks. Materials will be piled in neat stacks, stabilized by dunnage if necessary. Leaning or unbalanced stacks will be repiled immediately to prevent their falling.

d. Electric Light Fixture Clearance. Stacked materials will be kept at least 18 inches away from electric light fixtures.

e. Ignition Hazard. Smoking will not be permitted in any storage areas. Special locations may be designated for smoking areas in storage facilities:

(1) Where no fire hazard exists;

(2) When approved by the fire marshal;

(3) When plainly posted.

f. Waste Disposal. Oily rags and other wastes will be placed in fire resistant containers, equipped with self-closing lids. These containers will be emptied daily.

g. Fire Euipment. Stored materials wil be kept at least 18 inches from automatic sprinkler valves, fire hoses, extinguishers, sprinkler heads, exits, and fire doors. Stacks will be arranged to permit immediate access to all storage areas during a fire.

h. Second Deck Bins. Hand rails and ladders (portable or fixed) will be provided for safe access to second deck storage bins. Since these bins are more hazardous to use, the materials stored there should not require frequent handling.

i. Bulky Materials. Large, bulky, or unusually heavy materials should be stored near doorways to minimize the amount of handling needed and to make movement easier.

SAFE OPERATION OF ELECTRICAL POWER TOOLS

The wide use of electric power tools is evidence of their work value; however, they must be used properly because they may cause severe injuries if used improperly. Following is a list of precautions to take while using portable electric power tools:

a. Inspect the equipment, especially the external wiring, before you use it. Check for broken plugs and cracked wiring.

b. Use safety glasses or face shields where chips or dust could fly or tools could break. Do not wear jewelry, loose gloves, or loose clothing while using rotating equipment.

c. Change accessories with the power off and the cord unplugged. Replace the guard before starting the tool again.

d. If equipment is to be used in damp locations, use insulating platforms, rubber mats, and rubber gloves.

It is important to protect the cord on electric power equipment, and this is also true of the extension cord. Do not leave an extension cord where it will become abused. The conductors in the cord, the cord insulation, and the plugs must be protected. Scraping, kinking, or stretching, as well as exposure to grease and oil, will damage power tool cords or extension cords. Use heavy-duty plugs which clamp to the cord. Do NOT jerk the plugs from the receptacle to unplug them. This can damage the cord or cause the connection to become loose.

Operating Instructions. Before you operate or plug an electric power tool into a circuit, check the operating instructions. On large equipment these instructions are usually located on a data plate attached to the equipment. On smaller, portable equipment, where there is not room for a large data plate, first go to technical publications to find instructions. Check the operating instructions before operating any equipment.

Electrical Precautions and Hazards. The apprentice carpenter uses a wide variety of tools powered by electricity because of their convenience, speed and efficiency. However, because of their source of power, they are hazardous to operate unless you know how to safeguard against the hazards. The main hazards are from fire, improper groundings, and cord abuse.

Fire Hazard

Electrically powered handtools are a potential source of ignition for a fire if used near flammable materials or in explosive atmospheres, unless they are of the explosion-proof type. You must be continuously aware of this hazard as you work in areas that have a concentration of flammables.

Improper Grounding

When you use power tools, check them to make certain that they have three-wire cords. Make sure the tools is bonded to the ground. In addition to the three-wire cord, the extension cord must also have three wires and be plugged into a grounded receptacle to provide protection to the user. Figure 14 illustrates a drill motor with a three-wire plug and cord. Figure 15 shows how equipment grounding works. Modern double-insulated tools do not require equipment ground.

Cord Abuse

It is important to protect the cord on your power equipment. This also is true of the insulation of the cord. The conductors in the cord, the insulation on the cord and the devices (plugs) must be protected to provide safe operation. Scraping, kinking, or stretching, as well as exposure to grease and oil, will damage power tool cords or extension cords. Use heavy-duty plugs that clamp to the cord. Do not jerk them from the receptacle to unplug them, because this will damage the cord or cause the connection to become loose.

By observing safety precautions, fellow workmen will look to you as a craftsman.

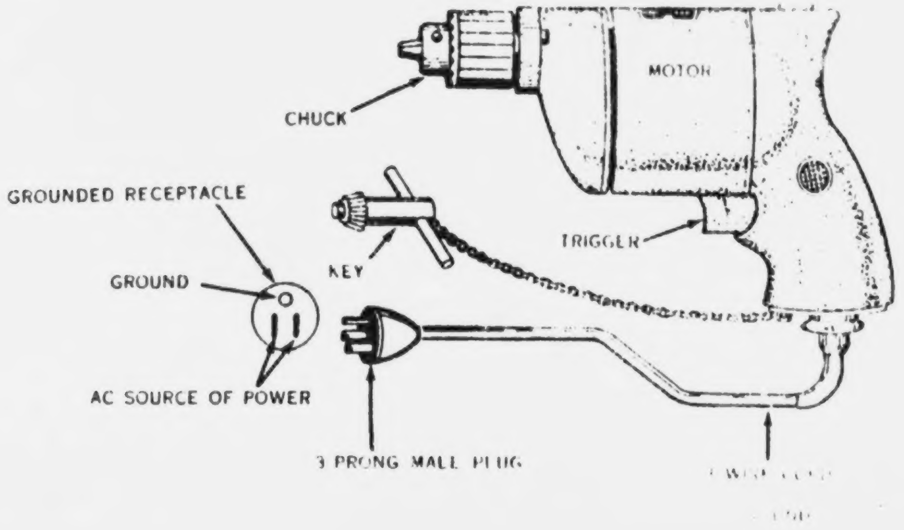
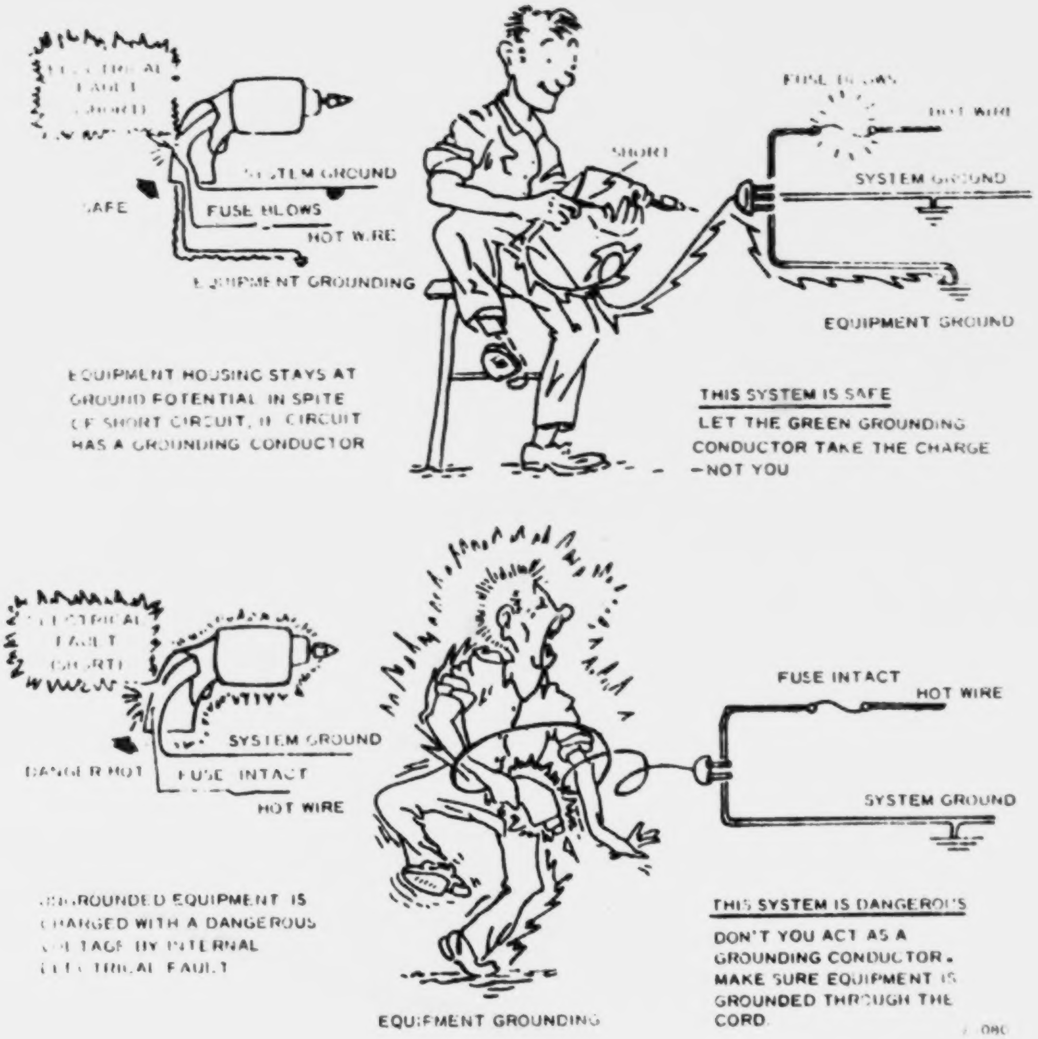


Figure 14. Drill Motor With Three-Prong Plug



ELECTRICAL FAULT (SHORT)
SYSTEM GROUND
SAFE
FUSE BLOWS
HOT WIRE
EQUIPMENT GROUNDING
SHORT
FUSE BLOWS
HOT WIRE
SYSTEM GROUND
EQUIPMENT GROUND
ELECTRICAL FAULT (SHORT)
SYSTEM GROUND
DANGER HOT
FUSE INTACT
HOT WIRE
FUSE INTACT
HOT WIRE
SYSTEM GROUND
EQUIPMENT GROUNDING

EQUIPMENT HOUSING STAYS AT GROUND POTENTIAL IN SPITE OF SHORT CIRCUIT, IF CIRCUIT HAS A GROUNDING CONDUCTOR

THIS SYSTEM IS SAFE

LET THE GREEN GROUNDING CONDUCTOR TAKE THE CHARGE —NOT YOU

UNGROUNDED EQUIPMENT IS CHARGED WITH A DANGEROUS VOLTAGE BY INTERNAL ELECTRICAL FAULT

THIS SYSTEM IS DANGEROUS

DON'T YOU ACT AS A GROUNDING CONDUCTOR. MAKE SURE EQUIPMENT IS GROUNDED THROUGH THE CORD.

Figure 15. Equipment Grounding

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EXPOSURE TO AIRBORNE ASBESTOS

Exposure does not normally occur when the asbestos is modified by a bonding agent, coating, binder or other material or bound in materials such as vinyl, asbestos tile, plastic and cement products, except when these materials are reshpaed or are decresaed and the fibers become uncoated, free and are released through friction, destruction, shaping, deterioration and like methods.

Because the greatest dangers of asbestos come from airborne fibers, procedures are established to protect the worker. Areas with a potential asbestos hazard are checked to determine the amount of airborne fibers. The asbestos levels of these areas may be controlled by local exhaust systems, dust collection and ventilation. Areas which still exceed the standards must be restricted, personnel checked and a daily roster of personnel kept. The type of respirator used will be determined by the amount of fibers in the air. Respirators must not interfere with the safety performance of personnel.

Other controls. Insofar as practical, handle, mix, apply, remove, cut, score or otherwise work asbestos in a wet state. Sufficient to prevent the emission of air borne fibers in excess of permissible limits. Do not remove asbestos cement, mortar, coating, grout, plaster, or similar material containing asbestos from bags, cartons, or other containers in which they are shipped, unless the material is wetted, enclosed, or properly ventilated. Other items which may include asbestos compounds are felts, shingles, ceiling tile, insulation, and floor tiles.

When working in concentrated amounts of asbestos workers should wear goggles, respirators, and protective clothing, and have showers available immediately upon completion of work. Wash hands, face and forearms thoroughly before eating, drinking or smoking. Follow the manufacturer's specifications on material handling requirements.

SUMMARY

The Air Force maintains a ground safety program designed to prevent accidents, and don't ever forget that most accidents can be prevented. Your part in this ground safety program is to become familiar with the causes of accidents and to follow the prescribed rules and precautions to prevent them. Some of the conditions which breed accidents are poor housekeeping, horseplay, improper use of tools and equipment, nonobservance of warning signs, and lack of an adequate fire prevention program. Of course, there are many other causes, among these are cases of personnel working with unfamiliar equipment or material. Therefore, to prevent accidents, it is necessary to know as much as you possibly can about the equipment and materials you come into contact with. In your assignment at various Air Force installations, you will be working with, or near, such items as mechanical equipment, electrical equipment, liquid and compressed gases, acids, and possibly even radioactive materials. Take the necessary time to personally learn as much as you possibly can about the equipment around you. Air Force manuals, pamphlets, technical orders, and commercial texts are available from which to learn this material.

The Air Force provides a variety of safety equipment and protective clothing, but you must become familiar with its location and use.

QUESTIONS

1. What is the definition of the word "accident"?
2. What percentage of accidents are considered by the Air Force as being "Natural Phenoma"?
3. What are five good rules of housekeeping?
4. What type of wrench is first choice when it is at all possible to use it?
5. What type of clothing should be worn around operating mechanical equipment?
6. What is the ratio of hammer accidents as compared to all other handtools accidents?

REFERENCES

AFM 67-3, Storage and Materials Handling
AFR 69-8, US Air Force Storgae
AFOSH STD 127-66, General Industrial Operations

SAFETY PRECAUTIONS WHEN HANDLING GLASS OR WOOD PRODUCTS

As carpenters, you will be handling glass and wood products. AFOSH Standards furnish you with some general rules for handling these products. However, most glass and lumber handling procedures are based on COMMON SENSE.

Common sense is not as common as most people think. You know that lumber is heavy and that you can get splinters when handling it. However, how many times have you seen people gather lumber for a project without bothering to wear steel-toed shoes or gloves?

Some safety precautions to follow when handling glass or lumber are:

Glass

(1) When moving large pieces of glass you should:

- Wear gloves
- Wear steel-toed shoes
- Mark an X across entire sheet of glass with tape or grease pencil, so no one will walk through it.
- Warn others in the area that you are moving glass.

(2) Newly installed glass (such as patio doors or large plate glass windows) should be marked with an X across entire sheet of glass with tape or grease pencil to prevent people from walking through the glass.

(3) When cutting glass, wear eye protection and gloves.

(4) After cutting glass, remove debris and usable glass from the cutting area. Store usable glass in specified glass storage area. Discard waste glass in specially marked glass disposal container.

(5) Remember at all times that glass can cut you or the people around you. Act accordingly.

Lumber

(1) When moving lumber, wear gloves and steel-toed shoes.

(2) When moving large pieces of lumber, alert others in the area and watch where you are going.

(3) Use proper lifting procedures when moving lumber. Use the legs for lifting, not the back.

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(4) When cutting lumber, wear eye protection. Observe safety precautions pertaining to the tool you are using.

(5) Lumber must be neatly stacked and easily reached by adequate aisleways.

(6) Cross ties, separaters, or dunnage will be used to guard against falling objects.

(7) Use care when stacking lumber so the lumber will not topple over.

(8) When moving a board:

  - The board should be grasped at the side to avoid crushing the hands.
  - Lumber should be walked through the hands instead of letting it slide (to eliminate many sliver and splinter injuries).

(9) Lumber piles shall not exceed 16 feet in height.

SUMMARY

The Air Force maintains a ground safety program designed to prevent accidents, and don't ever forget that most accidents can be prevented. Your part in this ground safety program is to become familiar with the causes of accidents and to follow the prescribed rules and precautions to prevent them. Some of the conditions which breed accidents are poor housekeeping, horseplay, improper use of tools and equipment, nonobservance of warning signs, and lack of an adequate fire prevention program. Of course, there are many other causes, among these are cases of personnel working with unfamiliar equipment or material. Therefore, to prevent accidents, it is necessary to know as much as you possibly can about the equipment and materials you come into contact with. In your assignment at various Air Force installations, you will be working with, or near, such items as mechanical equipment, electrical equipment, liquid and compressed gases, acids, and possibly even radioactive materials. Take the necessary time to personally learn as much as you possibly can about the equipment around you. Air Force manuals, pamphlets, technical orders, and commercial texts are available from which to learn this material.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-I-4

BASE CIVIL ENGINEER ORGANIZATION AND CAREER FIELD ORIENTATION

OBJECTIVES

a. Given incomplete and matching statements identify the mission, statements organization, functions, and responsibilities of CE units. Eight of ten items must be correct.

b. Given incomplete statements identify property accountability and responsibility by completing the statements. Eight of ten responses must be correct.

c. Given incomplete statements identify the organization of the structural/pavements career field by completing the statements. Eight of ten responses must be correct.

d. Given incomplete statements identify the duties, responsibilities, and career ladder progression requirnments of AFSs 55230/50. Six of eight responses must be correct.

e. Given incomplete statements identify Engineered Performance Standards (EPS) by completing the statements. Eight of ten responses must be correct.

INTROUDUCTION

Carpentry is a branch of the woodworking industry which is connected with the building of structures. It includes the building of forms, as well as construction of the building frame, roof, and interior trim. It also includes the manufacture and installation of cabinets and shelves.

A qualified carpenter must be skilled in the use of a wide variety of handtools, portable power tools, and shop equipment. A carpenter must know the characteristics of many different kinds of building materials. He must be able to read plans and blueprints; he must be able to estimate the amount of materials and the time required to do a job.

The carpenter's job is often dependent upon weather conditions and progress of construction. Much of a carpenter's job is done in conjunction with other tradesmen, such as masons, plumbers, and electricians. As a consequence, you should know where you fit in the Base Civil Engineer Organization.

This study guide is divided into two main subjects:

- BASE CIVIL ENGINEER ORGANIZATION
- CAREER FIELD ORIENTATION

INFORMATION

BASE CIVIL ENGINEER ORGANIZATION

The base civil engineering organization is responsible for the purchase, construction, maintenance, and operation of the base real property facilities. It is responsible for such functions as construction and maintenance of building, building and maintenance of roads and lawns, operation of water supply facilities, provision of fire protection, and even the responsibility for the control of insects and rodents.

Organization

Figure 8 shows the layout of a typical base civil engineer organization. The organization to which you will be assigned will be either a civil engineering group or a civil engineering squadron. In most cases, assignments are made to squadrons since groups are not too common and are found only on the larger bases.

Now, let's take a look at the organization. The officer who commands the base civil engineer organization is the base civil engineer (BCE). The prime duty of BCE is the operation and maintenance of the real property of the base. Included in this is the purchase and disposition, accountability and inventory, and the design and construction of facilities. Some of the other responsibilities of the BCE include traffic engineering, utilities and services, structure and aircraft fire protection, recovery from damage or destruction from enemy attack or natural disasters, and support of tenant activities.

Function

The typical base civil engineer organization chart in figure 8 shows that there are eight major functional sections: (1) Readiness Management, (2) Industrial Engineering, (3) Family Housing Management, (4) Squadron Section (5) Financial Manangement, (6) Operations, (7) Engineering and Environmental Planning, and (8) Fire Protection. Let's review the main responsibilities of these eight sections.

Readiness Management

This section is shown at the top left corner of Figure 8. Their main duties include organization, training and management of Prime BEEF teams.

Financial Management

This section, shown as number (1) at the top left corner of figure 8, serves as an advisor to the BCE. Develops, prepares, submits, and maintains the financial plan and budget estimates.

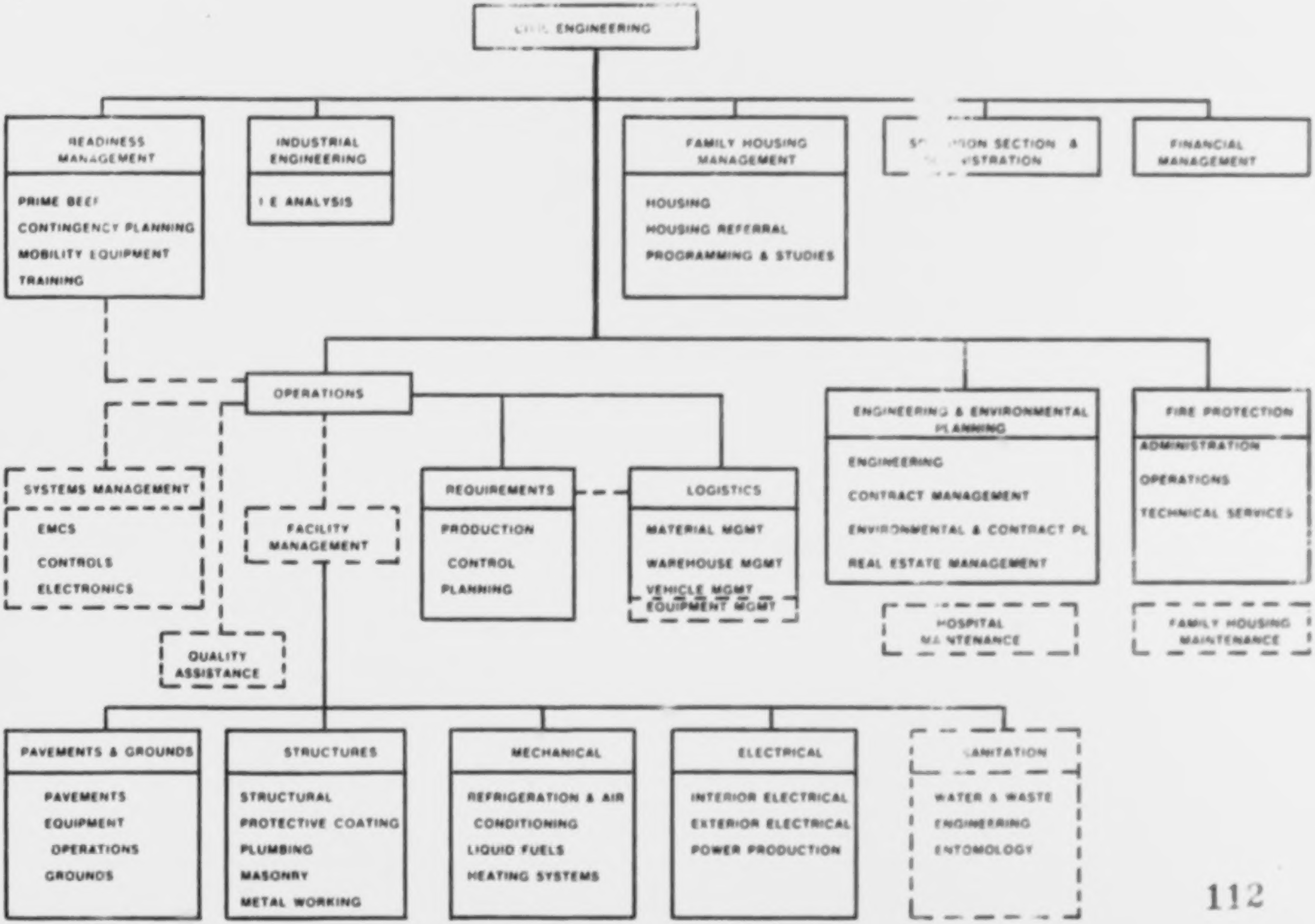
CIVIL ENGINEERING
READINESS MANAGEMENT
PRIME BEEF
CONTINGENCY PLANNING
MOBILITY EQUIPMENT
TRAINING
INDUSTRIAL ENGINEERING
I E ANALYSIS
FAMILY HOUSING MANAGEMENT
HOUSING
HOUSING REFERRAL
PROGRAMMING & STUDIES
S[illegible]ION SECTION & [illegible]ISTRATION
FINANCIAL MANAGEMENT
OPERATIONS
SYSTEMS MANAGEMENT
EMCS
CONTROLS
ELECTRONICS
FACILITY MANAGEMENT
QUALITY ASSISTANCE
REQUIREMENTS
PRODUCTION
CONTROL
PLANNING
LOGISTICS
MATERIAL MGMT
WAREHOUSE MGMT
VEHICLE MGMT
EQUIPMENT MGMT
ENGINEERING & ENVIRONMENTAL PLANNING
ENGINEERING
CONTRACT MANAGEMENT
ENVIRONMENTAL & CONTRACT PL
REAL ESTATE MANAGEMENT
FIRE PROTECTION
ADMINISTRATION
OPERATIONS
TECHNICAL SERVICES
HOSPITAL MAINTENANCE
FAMILY HOUSING MAINTENANCE
PAVEMENTS & GROUNDS
PAVEMENTS
EQUIPMENT
OPERATIONS
GROUNDS
STRUCTURES
STRUCTURAL
PROTECTIVE COATING
PLUMBING
MASONRY
METAL WORKING
MECHANICAL
REFRIGERATION & AIR CONDITIONING
LIQUID FUELS
HEATING SYSTEMS
ELECTRICAL
INTERIOR ELECTRICAL
EXTERIOR ELECTRICAL
POWER PRODUCTION
SANITATION
WATER & WASTE
ENGINEERING
ENTOMOLOGY

Figure _ 8 Base Civil Engineer Organizational Chart

4-3

Industrial Engineering

This section, shown as number (2) at the top left center of figure 8, serves as consultants to the BCE and staff for developing improvements to management systems. Evaluates the quality of service provided to CE customers and serves as technical consultant to the BCE on real estate and real property matters.

Family Housing Management

This section, shown as number (3) at the top right center of figure 8, serves as a source for housing referrals (list of off base housing available in the area), manages all base housing, conducts housing studies, and programs military housing construction.

Squadron Section

This section is shown as number (4) at the top right corner of figure 8. You are probably already familiar with the duties of personnel in the squadron section because this section handles the administrative work of the CE organization. The administrative section receives, distributes, and dispatches communications for CE; prepares reports and correspondence, maintains correspondence files; maintains the CE library; conducts special programs, drives, and awards; and supervises the recordkeeping and preparation of reports for the cost reduction program.

The squadron section also takes personnel actions that are given to it by the squadron commander. These actions include counseling, maintaining duty rosters, conducting general military training and commander's call, and enforcing discipline.

Fire Protection

This section, shown as number (5) in figure 8, administers fire protection programs and performs fire control services. It also inspects and tests fire protection and fire alarm systems, and services ground-type portable fire extinguishers.

Engineering and Environmental Planning

This section, shown as number (6) in figure 8, is staffed with architectural and professional engineers. Problems arising which are beyond the capability of operations and maintenance personnel are referred to the engineers in this section. Personnel of this section also review and develop technical provisions of contracts for real property facilities. Personnel of this section are also responsible for insuring that all present and future uses of the base do not endanger the natural resources as well as the quality of the living and working environment.

Operation

This section, shown as number (7) in figure 8, directs all work that will be done by each work center (number 9 thru 14). To assist the Chief of Operations in directing these work centers, is the Resources and Requirements Section, number (8) in figure 8. This section identifies, receives, processes, and plans work to be accomplished by CE. They also order, receive, and deliver materials required for job completion.

The major work areas (shops) under operations, shown in figure 8, are (9) pavements and grounds, (10) structures, (11) mechanical, (12) these areas may contain several work centers. For instance, the structures area, where you will likely work, has structural (carpentry), protective coating, plumbing, masonry, metal working, and a structural maintenance and repair team (SMART). Sometimes there are variations if there is no need for a particular activity.

PRIME BEEF

Combat Support

Project Prime BEEF. "When the whistle blows, are we ready to go?" This was the question asked by the Director of CE Operations, HQ USAF in December 1963. The answer was "No." However, under project "Prime BEEF" the answer is now "Yes". Project "Prime BEEF" created within the peacetime Air Force civil engineering force, the capability to perform direct combat support tasks in support of worldwide contingency operations. The contingency operation may be in response to war, hostile aggression, natural disaster or catastrophe.

The role of civil engineering has changed a lot since World War II. Civil engineering now has a direct combat support role. If you are selected to be a member of one of the Base Engineer Emergency Force teams, you must train to become more involved in contingency operations. In normal BCE work, you will be a member of a BEEF Team and be trained and prepared to go with that team on very short notice. You, as a carpentry specialist, must know how to build field facilities, such as mess halls, showers, and latrines.

In addition, you must have the know-how and have the ability to protect the facilities from enemy action. Your ability to support direct combat operations in these ways is the only reason for you wearing a military uniform during your normal peacetime duties.

Prime BEEF means "Base Engineer Emergency Forces." This type of force is made up of selected airmen and officers at bases throughout the United States. The personnel are members of units within the force called Prime BEEF teams. In the event of an enemy attack, a natural disaster, or an emergency work load, at either a stateside or an overseas base, a BEEF team can be made available to supplement the work force at the affected base. There are a number of Prime BEEF teams. At this time, however, you should become knowledgeable in the six major objectives of the Prime BEEF program.

Objectives of Prime BEEF. The following are the six major objectives of project Prime BEEF, as taken from AFR 93-3, The Prime BEEF Program:

(1) Alignment of the civil engineering military force to perform direct combat support tasks in support of the Air Force mission worldwide.

(2) Develop and maintain a highly skilled mobile military engineering force capable of rapid response for direct combat support of worldwide contingency operations.

(3) Insure effective use of the civilian engineering force in meeting requirements generated as a result of natural disasters and in response to indirect combat support needs.

(4) Provide supplementary training as necessary to insure military personnel are capable of performing tasks peculiar to direct combat support operations.

(5) A balanced military-civilian mix providing equitable career development opportunities for both military and civilian personnel.

(6) An adequate military manning to support Air Force rotation requirements.

Operation Concepts

The Prime BEEF program is structured to provide the following teams, BEEF C, F, RR, M, and augmentation teams. In addition, the Continental United States (CONUS) assigned personnel provide the military resource of trained personnel to satisfy Air Force contingency and rotation requirements on a worldwide basis.

Contingency Team (BEEF-C)

This team supports unforeseen contingencies and special air warfare operations, but is not attached to a specific air unit. There are several BEEF-C teams located throughout the Air Force. Headquarters USAF retains unilateral authority to deploy these teams, or any part of them, whenever required. These teams are normally deployed in TDY status usually for not more than 179 days.

Flyaway Team (BEEF-F)

There are several BEEF-F units in CONUS. They are attached to the Tactical Air Command (TAC) or Military Airlift Command (MAC), and move with and support those flying units wherever they are deployed. One important aspect of the flyaway team is that HW TAC or MAC may direct deployment of an "F" unit from another command's base on which it is a tenant.

Missile Team (BEEF-M)

The "M" team provides organization and depot level maintenance for real property installed equipment. If missiles are fired, these teams are available for deployment, unless the pad is to be recharged. There is no prescribed manning quota in this area. Therefore, manning for BEEF-M teams coincides with current authorizations.

Rapid Runway Repair Team (BEEF RR)

This team is a specialized engineering team capable of deployment within 72 hours to provide temporary, quick repair of runways. Heavy equipment necessary to complete this task may also be deployed if necessary.

Augmentation Team

These teams are structured within specific skill areas; i.e., vertical construction, horizontal construction, electrical, mechanical, water and sanitation, etc. The purpose of such teams is to provide large skill blocks to assist or augment BEEF C or F teams or in-place overseas theater teams in satisfying unique contingency requirements.

Function of RED Horse

Air Force squadrons with the title RED HORSE have the ability to repair major damage that is inflicted upon a base. The name RED HORSE is an acronym. This means that the letters in the name represent words. RED means "Rapid Engineer Deployable." HORSE means "Heavy Operations Repair Squadron, Engineer." When you put it all together, RED HORSE means "Rapid Engineer Deployable Heavy Operation Repair Squadron, Engineer." Try telling your friend the title of that unit. It's a mouthful, isn't it? It's like McDonald's hamburger on a sesame seed bun. "RED HORSE" is so much easier for you to say. The title, however, explains to a large extent, the function of the unit.

RED HORSE squadrons provide heavy repair and construction of horizontal and vertical base facilities when and where the requirements exceed the base CE's capabilities and when the work meets the mission given to RED HORSE by the Department of Defense. These squadrons are formed with trained personnel from all major commands. The men are given training to make them proficient in all areas of their skills. The training is necessary to meet the high standards required of men in RED HORSE squadrons. RED HORSE squadrons are capable of rapid deployment and are responsive to the following:

- Worldwide requirements as directed by Headquarters USAF.
- USAF tactical forces deployed in conjunction with war or the likely event of war.
- Establishment of new base facilities or the expansion and upgrading of existing base facilities.
- Meeting recovery requirements for Air Force facilities in case of natural disasters.
- Training exercises, maneuvers, and special projects.

RED HORSE also makes major construction alternations and additions to an existing base, as would be the case when a runway is lengthened, a hanger is built, or aircraft parking ramps and taxiways are constructed.

The RED HORSE squadron can move on to an abandoned air base and restore it to the extent necessary for flying operations. Likewise, the squadron can move into an area where there has never been a base and build one.

CAREER FIELD ORGANIZATION

You have had a chance to see that a civil engineer organization requires a variety of professional people and tradesmen to operate and maintain the many facilities for a base, each with specific jobs to perform.

These jobs fall into distinct categories called Air Force Specialty Codes (AFS). The different categories are identified by numbers. Each number of the code has a meaning. Figure 9 explains the breakdown of AFSC 55250. You will be awarded AFSC 55250 when you acquire the knowledge provided by this course and learn the skills through on-the-job training.

First Two	55	Career Field	Airman Civil Engineering Structural/Pavements
Third	2	Career Field Subdivision	Structural
Fourth	5	Skill Level of AFS	Skilled Level
Fifth	0	Specific Air Force Specialty	Carpenter

Figure 9. AFSC 55250 Breakdown

Figure 10 is a chart showing progression in the structural/pavements career field. To see how you can progress in your career field ladder, start at the block with the heavy broken lines and follow the heavy solid lines to the skill level you are studying for now. After you earn AFSC 55250, and you are promoted to SSgt, you will be placed on OJT and enrolled in the CDC for the next level, structural technician AFSC 55273. Notice in figure 10 that the carpentry and masonry career fields merge at 7 level.

The structural superintendent level (AFSC 55299) is the next step for you after you have gained experience as a structural technician.

Study figures 11 and 12 for the specialty descriptions for a carpentry specialist. Specialty descriptions describe the duties and responsibilities of the AFSC, and are listed in AFR 39-1.

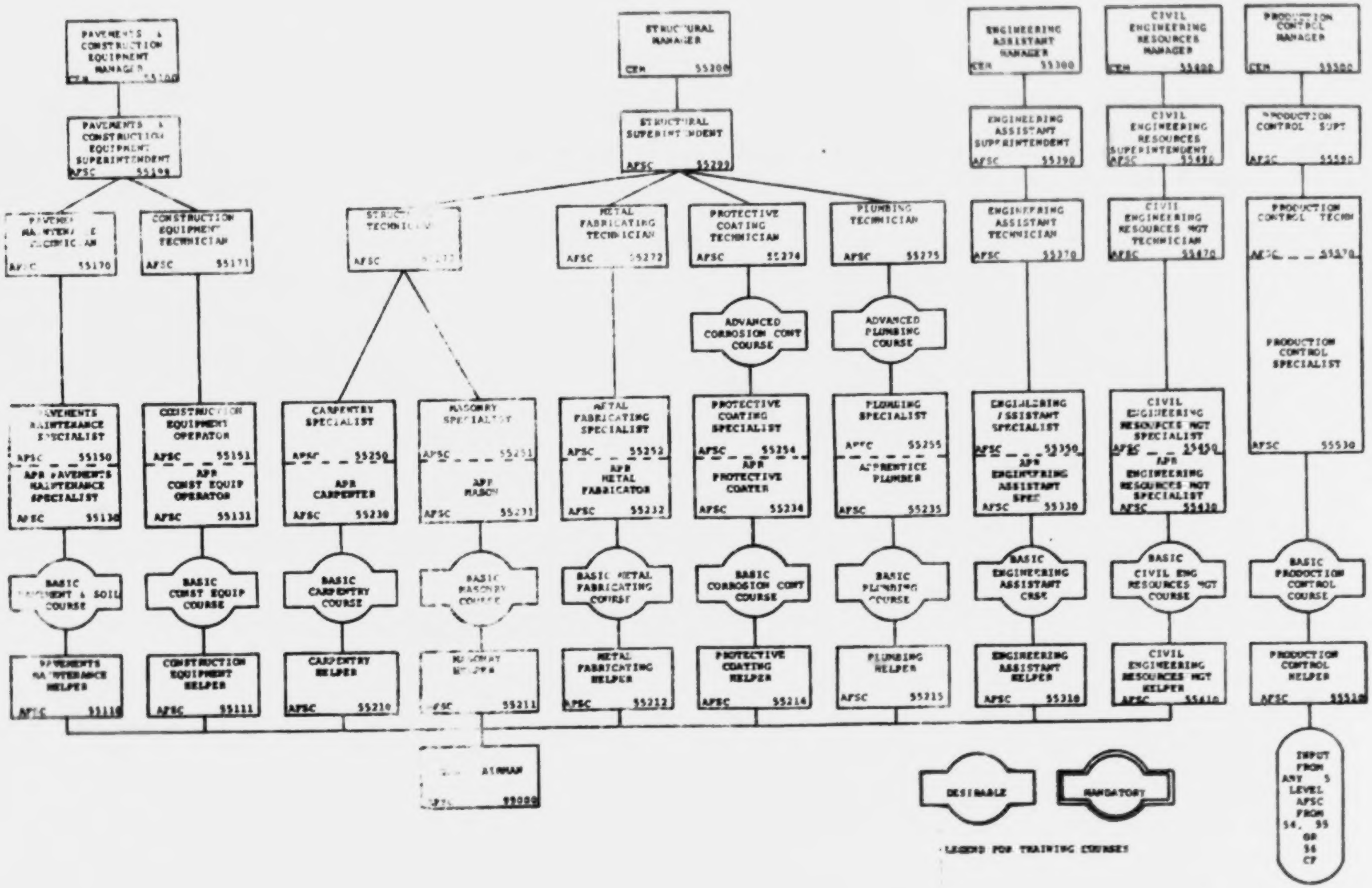
PAVEMENTS & CONSTRUCTION EQUIPMENT MANAGER
CEM 55100
PAVEMENTS & CONSTRUCTION EQUIPMENT SUPERINTENDENT
AFSC 55199
PAVEMENTS MAINTENANCE TECHNICIAN
AFSC 55170
CONSTRUCTION EQUIPMENT TECHNICIAN
AFSC 55171
PAVEMENTS MAINTENANCE SPECIALIST
AFSC 55150
APR PAVEMENTS MAINTENANCE SPECIALIST
AFSC 55130
CONSTRUCTION EQUIPMENT OPERATOR
AFSC 55151
APR CONST EQUIP OPERATOR
AFSC 55131
BASIC PAVEMENT & SOIL COURSE
BASIC CONST EQUIP COURSE
PAVEMENTS MAINTENANCE HELPER
AFSC 55110
CONSTRUCTION EQUIPMENT HELPER
AFSC 55111
STRUCTURAL MANAGER
CEM 55200
STRUCTURAL SUPERINTENDENT
AFSC 55299
STRUCTURAL TECHNICIAN
AFSC 55270
METAL FABRICATING TECHNICIAN
AFSC 55272
PROTECTIVE COATING TECHNICIAN
AFSC 55274
PLUMBING TECHNICIAN
AFSC 55275
ADVANCED CORROSION CONT COURSE
ADVANCED PLUMBING COURSE
CARPENTRY SPECIALIST
AFSC 55250
APR CARPENTER
AFSC 55230
MASONRY SPECIALIST
AFSC 55251
APR MASON
AFSC 55231
METAL FABRICATING SPECIALIST
AFSC 55252
APR METAL FABRICATOR
AFSC 55232
PROTECTIVE COATING SPECIALIST
AFSC 55254
APR PROTECTIVE COATER
AFSC 55234
PLUMBING SPECIALIST
AFSC 55255
APPRENTICE PLUMBER
AFSC 55235
BASIC CARPENTRY COURSE
BASIC MASONRY COURSE
BASIC METAL FABRICATING COURSE
BASIC CORROSION CONT COURSE
BASIC PLUMBING COURSE
CARPENTRY HELPER
AFSC 55210
MASONRY HELPER
AFSC 55211
METAL FABRICATING HELPER
AFSC 55212
PROTECTIVE COATING HELPER
AFSC 55214
PLUMBING HELPER
AFSC 55215
ENGINEERING ASSISTANT MANAGER
CEM 55300
ENGINEERING ASSISTANT SUPERINTENDENT
AFSC 55390
ENGINEERING ASSISTANT TECHNICIAN
AFSC 55370
ENGINEERING ASSISTANT SPECIALIST
AFSC 55350
APR ENGINEERING ASSISTANT SPEC
AFSC 55330
BASIC ENGINEERING ASSISTANT CRSE
ENGINEERING ASSISTANT HELPER
AFSC 55310
CIVIL ENGINEERING RESOURCES MANAGER
CEM 55400
CIVIL ENGINEERING RESOURCES SUPERINTENDENT
AFSC 55490
CIVIL ENGINEERING RESOURCES MGT TECHNICIAN
AFSC 55470
CIVIL ENGINEERING RESOURCES MGT SPECIALIST
AFSC 55450
APR ENGINEERING RESOURCES MGT SPECIALIST
AFSC 55430
BASIC CIVIL ENG RESOURCES MGT COURSE
CIVIL ENGINEERING RESOURCES MGT HELPER
AFSC 55410
PRODUCTION CONTROL MANAGER
CEM 55500
PRODUCTION CONTROL SUPT
AFSC 55590
PRODUCTION CONTROL TECHN
AFSC 55570
PRODUCTION CONTROL SPECIALIST
AFSC 55530
BASIC PRODUCTION CONTROL COURSE
PRODUCTION CONTROL HELPER
AFSC 55510
INPUT FROM ANY 5 LEVEL AFSC FROM 54, 55 OR 56 CF
AIRMAN
AFSC 99000
DESIRABLE
MANDATORY
LEGEND FOR TRAINING COURSES

Figure 10. Airman Civil Engineering Structural/Pavements Career Field Chart

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AFSC 55250
Semiskilled AFSC 55230
Helper AFSC 55210

AIRMAN AIR FORCE SPECIALTY

CARPENTRY SPECIALIST

1. SPECIALTY SUMMARY

Constructs, maintains, plans, and repairs buildings, structures and appurtenances; assembles prefabricated structures. *Related DOD Occupational Subgroup:* 712.

2. DUTIES AND RESPONSIBILITIES

a. *Maintains and repairs buildings and structures.* Maintains and repairs walls, flooring, and other carpentry construction by removing and replacing damaged lumber, gypsum board, asphalt tile, and other finishing materials. Maintains and repairs doors, windows, screens, and trim. Repairs appurtenances by replacing parts or sections with properly matched woods. Repairs heavy timber structures such as warehouse loading docks, boat docks, wharves, and piling.

b. *Constructs, erects, and modifies buildings and structures.* Erects wooden framework by placing, joining and fastening sills, joists, subfloors, wall studs, rafters, and wall and roof sheathing using carpentry hardware and fastening devices. Erects steps, staircases, and porches. Constructs chutes and openings for heating, plumbing, or ventilating equipment. Installs window frames, sashes, and doors. Alters buildings by installing or removing partitions, finishing attics or basements, or by adding porches or rooms. Constructs and/or erects scaffolding. Constructs prefabricated wooden forms and assists other specialties in the construction and installation of wooden forms for construction such as concrete slabs, walls, foundations, steps, and other structures and for shoring operations such as trenching and excavating. Erects prefabricated buildings.

c. *Constructs and installs finishes and furnishings.* Installs siding, roofing, flooring, ceiling, and other coverings using gypsum board, plywood, fiberboard, or other nonmasonry materials. Constructs and installs doors, windows, and screens and installs glass in sashes. Installs interior and exterior trim such as moldings and facings. Installs finishing materials using woodworking tools, such as circular saw, lathe, and disk sander. Shapes wood to specific designs and proportions, cuts intricate fittings to join items, and fastens parts together by use of screws, dowel pins, nails or glue. Cuts, joins and fastens lumber by cutting tenons, mortises, bevels, miters, grooves, and curves using tools and equipment such as mortiser, tenoner, variety and coping saws. Constructs facilities such as shelves and bins for storage of supplies or equipment. Constructs interior appurtenances such as lockers, closets, and utility cabinets. Installs prefabricated articles such as cabinets and bookcases. Applies laminated plastics.

d. *Lays out and prepares carpentry materials.* Interprets construction plans, sketches, or other specifications. Determines carpentry requirements, and types, dimensions, and quantities of materials required. Prepares sketches to depict written carpentry details to simplify the use of complicated plans and to assist planners, engineers, and real estate personnel in the preparation and maintenance of construction, record and as-built drawings. Marks cutting and assembly lines and fitting locations on carpentry materials. Arranges materials to effect efficient work procedures. Fabricates building materials to construction plans and specifications using manual or powered portable and shop tools and equipment. Positions and aligns carpentry materials using tools such as peavey, spirit level, and plumb bob. Assists personnel of other specialties in the placement and alignment of batter boards and heavy timber for larger construction projects.

e. *Maintains carpentry and woodworking tools and installs and replaces building hardware.* Cleans and oils metal parts of tools and equipment to prevent rusting. Repairs and adjusts belts and lubricates bearings of machinery. Sharpens cutting tools and replaces and adjusts cutting blades. Installs, replaces, and adjusts items of building hardware such as hinges, hasps, locks, and hydraulic door openers and closers.

f. *Performs planning activities.* Prepares facility survey schedules. Performs facility surveys. Makes on-site investigations of proposed work to determine resource requirements. Prepares cost estimates for in-service work requests. Applies Engineered Performance Standards (EPS) in planning and estimating jobs. Coordinates plans with other civil engineering and base activities.

g. *Supervises carpentry personnel.* Lays out work and assigns tasks within workcrews. Conducts on-the-job training.

3. SPECIALTY QUALIFICATIONS

a. *Knowledge:*

(1) Knowledge of building maintenance, repair, and construction; nomenclature of woodworking materials and methods of storing wood; theory of squaring by equivalent measurement; application of simple mathematics; use of carpentry and woodworking manual and power tools; and wood treatment procedures is mandatory. Possession of mandatory knowledge will be determined according to AFR 35-1.

(2) Knowledge of properties of fine wood and of laminating and gluing is desirable.

b. *Education.* Completion of high school with courses in mathematics and mechanical drawing is desirable.

c. *Experience.* Experience in functions such as construction and repair of buildings and heavy structures and erection of prefabricated structures is mandatory.

d. *Training.* Completion of a basic carpentry course is desirable.

e. *Other.* Physical qualification for military drivers according to AFR 160-43 is mandatory for entry into this AFSC.

Figure 12

UPGRADE TRAINING

You have seen where your job will be located within Civil Engineers and what jobs are required of you as a carpenter. By looking at figure 10, you can see that as you gain in rank in the Air Force, you also have to gain additional knowledge to go along with the rank.

There are two (2) ways to be upgraded in skill level. The first of these ways is the way that you are getting your level. This is formal technical training. This type of training is sometimes used to award either a 3, 5, or 7 level AFSC.

The next type of training is the type that is the most commonly used. This is a two-part program consisting of OJT (On-the-Job Training) and CDC working with skilled carpenters learning how to do the work and knowledge that you learned through self-study. This type of training is the type that you will use for upgrading to the 5 skill level; and, when you make Staff Sergeant, you receive it for upgrade to the 7 skill level.

The completion of the CDC (knowledge) portion of the program is very important. Most of you have hopes of becoming an E-4, and the only way that this can be done is to possess a 5 level. You cannot be promoted to E-4 without it. Upon arrival at your next duty station, one of the first things the squadron will do is enter you into OJT for your 5 level. The CDC portion of your OJT consists of three (3) volumes that are self-study. You have an open book test at the end of each volume; and, if you pass these, you will be scheduled to take the fianl exam at the Base Testing Office. After this is done and if you pass this test, which you should, there are two (2) other things needed to give you a 5 level. One of these is your supervisor saying that you have acquired the skills required and the other is having spent six (6) months on OJT. When all these have been accomplished, the paper work will be started to get you your 5 level. You notice that it takes six (6) months in training to get your 5 level, but you can complete your CDC course in about two (2) to three (3) months. It would be to your advantage to get this portion out of the way as quickly as possible. This will allow you to place all your effort on improving your job skills.

The process for being given a 7 level (AFSC 55273) is basically the same as for the 5 level. The minimum time to get a 7 level increases to one (1) year. You must be a Staff Sergeant. You have the added knowledge of the Masonry Career Field, AFSC 55251, due to our combining with the masonry field at the 7 level. You also have to spend time as a supervisor to show that you can supervise other workers and take either a Base Management Course or a CDC Management Course.

To be awarded a 9 level (AFSC 55299), you must be a Master Sergeant, spend at least 1 year as a Master Sergeant, and pass the Air Force Supervisory Exam. You'll notice that there is no skill knowledge required other than the Supervisor's Exam. It would be extremely difficult for a 9 level to know everything from five (5) different career fields. His job is to manage those shops under his control, relying upon the knowledge of the shop foremen to handle the technical problems that come up.

SUMMARY

The Civil Engineer Organization has the responsibility of operating and maintaining all real property. We, who are part of Air Force Civil Engineers, must be aware of the tremendous costs involved. We must do all we can to conserve dollars and make our labor economical for the operation and maintenance of this real property.

If we work hard, study and do our best, we can expect to climb up the career field ladder from a 99000 to perhaps a 55299.

QUESTIONS

1. Name as many jobs as you can that the BCE does.
2. What is real property?
3. Using the organization chart in figure 8, the Carpentry Area is directly responsible to what section?
4. Sewage plants and systems are under what section of the BCE organization?
5. What is the purpose of the Air Force Specialty Code?
6. What are the main tasks of a Carpentry Specialist?

REFERENCES

AFR 39-1, Airman Classification Regulation

CONSTRUCTION MATERIALS

OBJECTIVE

a. Given incomplete statements, identify the characteristics of construction materials by completing the statements. Twenty of twenty-five responses must be correct.

INTRODUCTION

As an Air Force carpenter, your day by day job of keeping a base up to standards while supporting the mission of the base is an important job that calls for a great deal of job knowledge and especially a knowledge of all the materials that are used on your job.

Just as it is important for a carpenter to use the proper tools to do a job, it is just as important to use the right materials for a specific job. In this study guide, we will cover most of the building materials that you will use on a day to day basis.

Information in this study guide is presented in the following main topics:

- TYPES OF WOOD
- PLYWOOD
- GRADES OF PLYWOOD
- LUMBER SIZES
- LUMBER GRADES
- LUMBER DEFECTS
- BUILDING HARDWARE

INFORMATION

TYPES OF WOOD

First of all, we will learn about some of the types of wood you will use. You may not use all of these woods at any one base, but Air Force wide, they are probably all being used.

Birch

A strong, hard wood that works well with machinery. It is used mostly for quality furniture, cabinetwork, plywoods, and dowels, but the most common use of birch you will see is the coverings for doors.

Walnut

A fairly dense and hard wood. It works well with machinery and finishes beautifully. It is used for quality furniture, fine cabinet work, and frames for both pictures and charts.

Douglas Fir

Strong soft wood that splits easily. Large amounts of fir are used for plywood and framing members.

Pine

Lightweight and soft, straight grained with a uniform texture. This is probably the most common of the woods you will use. It is used in everything from wall studs to interior trim.

Mahagony

A medium hard and dense wood, very stable with even texture, open pores, and beautiful grain patterns. Color varies from dark red to light tan. It is used for quality furniture and doors.

Maple

A hard, strong and heavy wood with a fine texture and grain pattern. Its color is light tan with occasional dark streaks. It is used for quality furniture and flooring.

Oak

A very hardwood, durable, and strong used for furniture and flooring. Its color varies from greyish brown to reddish brown to a deep brown.

Redwood

A soft and lightweight wood, usually fine textured and even grained. It is easy to work and very durable. It is used especially where exposure to water and moisture is a factor. Highly resistant to decay.

Some of the woods we have covered are soft woods and some are hard. Can you look at a tree and tell if it is a hard or soft wood? You can do it and it's probably one of the easier things you will learn to do.

The major difference between them is that soft woods have needles. This type of tree is called coniferous because most of them bear cones. The hardwood trees have broad leaves that they shed at the end of the growing season. Most trees are going to fall into one of these two groups even though some of the hardwood trees produce a wood that is softer than some of the softwoods.

PLYWOOD

Plywood is probably one of the most widely used builiding materials. It can be used for boxes, to waterproof basement foundations and most any use in between.

Plywood can be found in many different thicknesses from 1/4" up to 1 1/4" being the most common sizes. The overall size of a sheet of plywood is 4' by 8' and, as you can see, this makes it very easy to cover walls, floors, or a roof in a short time due to the fact that one sheet will cover 32 square feet at a time.

Plywood is broken into two major types, interior and exterior. The interior type is used mostly for the inside of a structure where it will not come in contact with moisture or the weather. If you need an interior type of plywood due to its surface being a better grade of wood, but may come in contact with moisture, you can get interior plywood with exterior glue. This type of glue is resistant to water and will not let the veneers separate the way regular plywood will when it gets wet.

Exterior plywood is used just like its name, on the exterior of a building or on a job outside. The surface of exterior plywood is not as good as interior because it is usually covered with some other material. As we said before, it has a water resistant glue to keep it from coming apart.

GRADES OF PLYWOOD

Plywood is made up of veneers (layers). It is graded by the condition of these veneers and stamped on the back of the plywood to let you know exactly what grade you are getting. It is to your advantage to know how plywood is graded so that you can use the proper grade for any given job.

Grade AA: Special order "natural finish" veneer. Select all heartwood. Free of open defects. Uses where finish is the most important thing.

Grade A: Smooth and paintable. Neatly made repairs permissible. Also used for natural finish in less demanding applications.

Grade B: Solid surface veneer. Circular repair plugs and tightknots are permitted.

Grade C: Knotholes up to 1". Occasional knotholes 1/2" or larger permitted, providing total width of all knots and knotholes within a specified section does not exceed certain limits. Limited splits permitted. Minimum veneers permitted in exterior plywood.

Grade C Plugged: Improved C veneer with splits limited to 1/8" in width and knotholes and borer holes limited to 1/4" by 1/2".

Grade D: Permits knots and knotholes to 2 1/2" in width and 1/2" larger under certain specified limits. Limited splits permitted.

Here are a few examples of grades of plywood you would use for a specific job.

EXAMPLE	GRADE
1. Installing roof sheathing	CD
2. Building a storage cabinet	AC
3. Setting forms for concrete where one surface will show	AC
4. Building a display case where finish is important	NA
5. Replacing the sides on a reviewing stand	AC

Always remember, before you select the plywood for a job, to be sure what the end product is going to be. Select the proper grade of plywood to give the proper result.

LUMBER SIZES

If you have had any dealings with a lumber yard, you probably know that lumber has two sizes. These are the nominal size and the dressed size.

When you walk into the lumber yard and ask for a 2 x 4, you are asking for the nominal size. This is the size of the rough unfinished lumber. This is the measurement used when you figure board feet.

The size of the board you get when you ask for a 2 x 4 is called the dressed size. It is really 1 1/2 inches by 3 1/2 inches. This size is a result of the lumber being seasoned and surfaced.

The easy way to figure the actual size is take 1/2" off of both the width and the thickness of the lumber. The exception to this is if you ask for a piece of lumber such as 1 x 4, 1 x 6, 1 x 8, 1 x 10, or 1 x 12. Instead of taking 1/2" off of the thickness, they only take off 1/4". So, your actual size of a 1 x 4 would be 3/4" x 3 1/2".

LUMBER GRADES

Lumber is divided into different groups called grades. Each of these grades are set up so that you will be able to select the proper wood for a given type of job.

The highest grade of lumber is rated as FAS (First and Second). This grade is placed on hard wood that is of the very highest quality.

Select is the second grade of lumber. This permits pieces to be at least 4 1/4 wide and 6' long.

The third and most common type of grading is called Common. Common lumber allows for more defects than the other grades. Common is broken down into grades from #1 which is the best to #5, the worst.

LUMBER DEFECTS

As a carpenter, you will have to check the lumber that you use to insure that it is structurally sound. To do this, you have to know what some of the defects are.

Types of defects:

Knots - Caused by an imbedded branch or tree limb. Knots are considered strength reducing. The amount of strength lost depends upon the type, size, and location of the knot.

Splits and Checks - A separation along the grain, a result of uneven seasoning.

Pitch Pockets - Internal cavities that contain pitch either in a solid or liquid form.

Honeycombing - A separation of wood fibers within the interior of a board.

Wane - The presence of bark or the absence of wood along the edge of a board.

Blue Stain - A blemish caused by mold or a fungus. It is not considered strength reducing.

Decay - A disintegration of wood fibers due to a fungus. This can result in wood that is soft or spongy, and crumbles easily.

Holes - Can be caused by encased knots falling out, improper use of handling equipment, or woodboring insects or worms.

Warp - Distortion of the wood from a straight or even surface. Can be called a bow, crook, twist, or cup.

BUILDING HARDWARE

We have covered the different types of wood products that you can use as an Air Force carpenter to support your base's mission. No matter how good the material is, you still must have some way to hold it together or to mount it to something. This brings us to the next topic which is Building Hardware.

The term "hardware" is used to identify the metal items used by the carpenter. Items of hardware are generally divided into two classes, "rough" hardware and "finish" hardware.

Rough hardware contains a large number of items generally made of iron or steel with no particular ornamental finish on the metal. Rough hardware is usually concealed within the parts of a structure and when installed, becomes a component part of the structure. Rough hardware is not used for decorative purposes as is finish hardware and generally does not add to the appearance of the building. Some very common items of rough hardware are nails, screws, and bolts.

NAILS

Nails are formed by machine from standard sized wire. The wire is fed into the machine from a roll. It is straightened, the point is cut, and the head is formed all in one operation. Wire nails are divided into five main types-common, box, finishing, casing, and scaffold-shown in figure 13.

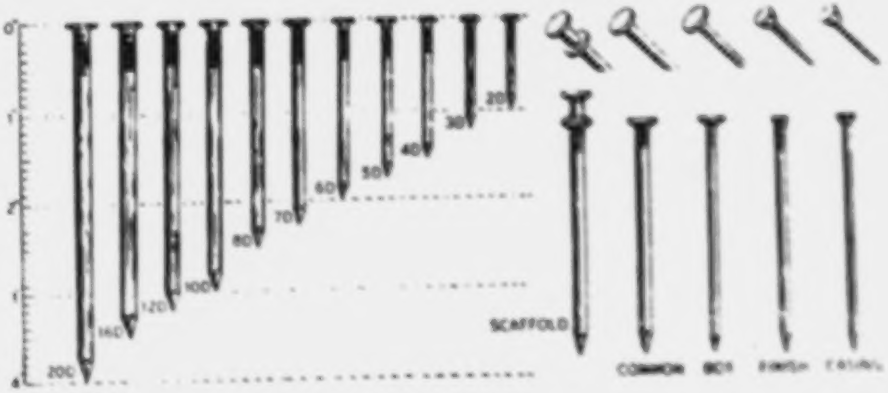


Figure 13. Types and Sizes of Nails

Nail Size

The pennyweight or pound number from twopenny to twentypenny, was originally the weight of one thousand nails. A small letter "d" is usually used to abbreviate "penny." The penny number now refers to the length of the nail instead of its weight. The nail chart in figure 1 shows the length of nails from 2d to 20d. Nails are usually packaged in 100-pound wooden kegs. Smaller quantities, however, can be purchased, usually in cardboard boxes.

Common Nails

Common wire nails have a fairly thick flat head. They are generally used for most phases of building construction. The wire from which they are made is large enough for easy driving without bending.

Box Nails

Box nails are used in box construction or wherever a common nail might split the wood. These nails bend more easily while you are driving them because of the smaller wire used to form them. The head of a box nail is somewhat thinner and larger in diameter than the head of a common nail. Box nails are sometimes coated with a special cement to give them better holding qualities and make them harder to pull. These are called "cement-coated" box nails or "sticky" nails.

Finishing Nails

Finishing nails and box nails are made with the same diameter of wire. The head of a finishing nail is only slightly larger in diameter than the body of the nail so that it can be embedded (set) into the surface of the wood. A slight depression on the top of the head helps keep the nail set from slipping off the head. The small hole that is made in the wood is filled with glazier's putty or some other filling agent to hide the nail head when the surface is finished.

Casing Nails

The casing nail is similar to the finishing nail in appearance. The head, however, is slightly larger and has no depression in the top. These nails are used to nail door and window casings in place.

Scaffold Nails

The scaffold nail has the same diameter as the common nail, but it has a double head. These nails are used on scaffolds, forms, and other temporary construction where the nails must be removed after a short time. The first (bottom) head draws the board and has a good binding effect. The second (top) head sticks out so that it can be used for pulling the nail.

WOOD SCREWS

Wood screws are made of iron, bronze, brass, copper, and other metals. They are sometimes plated with nickel or chrome to match special finish hardware. Wood screws have some advantages over nails, but they also have disadvantages. A few of the advantages are that they hold the wood more securely than nails, they are easily tightened and removed, and the heads are neat in appearance and are often left exposed on finished surfaces. Some of the disadvantages are that they are more expensive than nails and driving them requires more care and labor. Wood screws are made with heads that are either flat, oval, or round, as shown in figure 14. They have different sized shanks and a great variety of lengths. The shank of the screw is the smooth part of the screw between the head and the threads of spiral.

Screw size is a gauge number that represents the diameter of the shank of the screw. If you know the diameter, you can determine the approximate gauge by subtracting 1/16 inch from the diameter and multiplying the result by 80. For example, the diameter of a screw is approximately 3/16 inch. Subtract 1 1/16" from 3/16" and the result is 2/16" or 1/8". One eight multiplied by 80 equals 10, so the screw gauge is 01. If you know the screw gauge, you can find the diameter by dividing it by 80 and adding 1/16. The variation in the length of wood screws is about the same as that for nails, except that each gauge of screw is made in several lengths. You must give both the length and gauge number when you are specifying screws: for example, 1 1/4 inches by 10. Screws are packaged in cardboard boxes of 1 gross each: however, they can usually be purchased by the dozen.

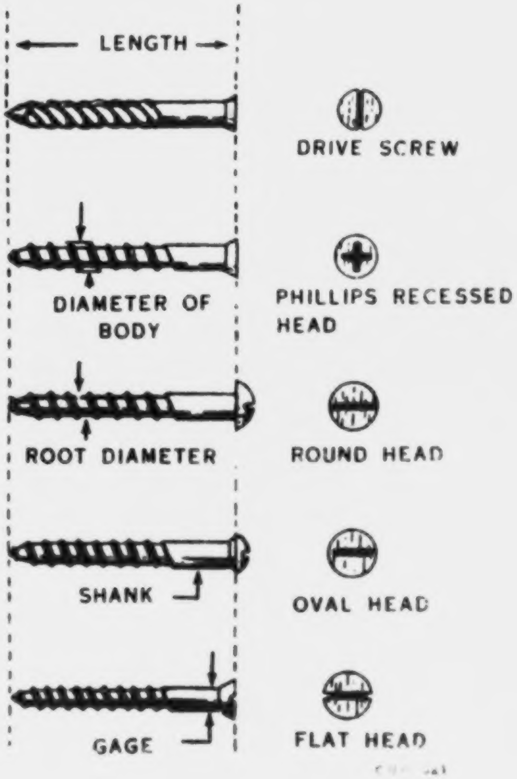


Figure 14. Types of Wood Screws

Drive Screws

Special screws that are made to be driven with a hammer are called drive screws. They may have a round head, but are usually made with a flat head. The threads are far apart and may have no slot for a screwdriver. Drive screws are available in the same sizes as wood screws.

Phillips-Head Screws

These have an X-shaped driving slot and a special screwdriver is needed for driving them. Some advantages of the philips screw are that the screwdriver doesn't slip out easily and the head does not break as quickly as that of a conventional type screw. They are available with round, oval, or flat heads.

Roundhead Screws

The roundhead screw is usually used on a surface where the head will show. The head is not countersunk, and for this reason, it should have a pleasing finish-either blued or polished. Always leave the screw slot in a position parallel to the grain of the wood.

Ovalhead Screws

The ovalhead screw is used to fasten hinges or other finish hardware to wood. The screw slots of all these screws should parallel each other for better appearance. These screws are countersunk so that only the oval portion of the head is above the surface.

Flathead Screws

Flathead screws are made to be used where the head will not show. The head should be countersunk until it is level with or slightly below the finished surface. If flathead screws are used on an exposed area, they should be countersunk into a hole that can be plugged to completely cover the head.

BOLTS

Bolts are made of steel with either round, square, or octagon heads and threaded shanks, as shown in figure 15. The threads may run the full length of the bolt, or they may stop a certain distance from the head, leaving a smooth upper shank. Bolts are used to fasten timber, steel, and other materials. They range in diameter from 3/16 inch to 1 1/2 inches and in length from 3/4 inch to 30 inches. They are available in three main styles: (1) stove bolts, (2) machine bolts, and (3) carriage bolts.

Stove Bolts

Stove bolts have either a flat or round head like a wood screw. A screwdriver must be used to keep the bolt from turning as the nut is tightened. The flat bevel head is not suitable for use with a washer because the washer tends to cup as the bolt is tightened. For this reason, stove bolts are seldom used in woodworking, but are used mostly with small items of hardware.

Machine Bolts

The machine bolts used in woodwork usually have square heads and square nuts. A metal washer is generally used

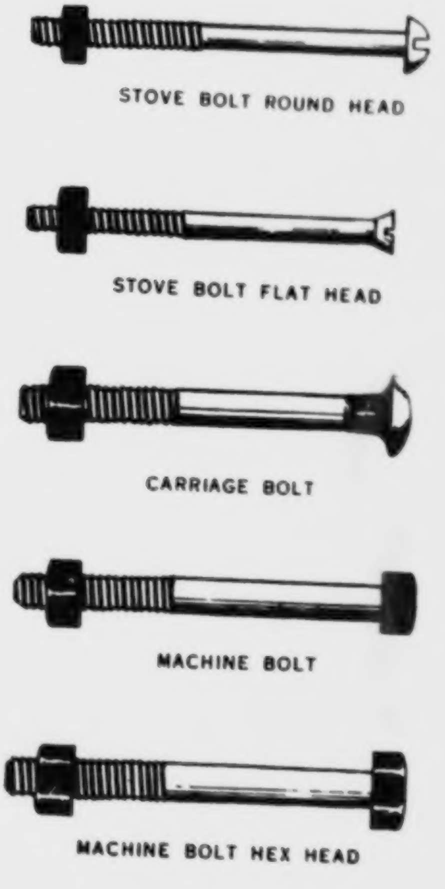


Figure 15. Types of Bolts

under both the head and nut. These washers prevent the head from embedding into the wood and the nut from tearing the wood fibers as it is turned. Two wrenches are required for tightening the machine bolt.

Carriage Bolts

Carriage bolts are like machine bolts except for the head, which is round. The shank of the carriage bolt has a square portion that draws into the wood and prevents the bolt from turning as the nut of the carriage bolt, but not under the head.

Hardware used for ornamental purposes, such as hinges, drawer pulls, and other miscellaneous items, is classed as finished hardware. We will discuss a few of the most frequently used items in the following paragraphs.

HINGES

The woodworker uses many different types, styles, and sizes of hinge. They are, however, all used to make a movable joint between two pieces of material. They are made of many different metals for various uses. The most common hinges have two leaves that are cut and formed so that they can be held together with a pin. The pin may be removable (loose pin), as shown at the top of figure 16, or it may be riveted on each end to prevent its removal (tight pin). If loose pin hinges are used on a door, you can remove the door by removing the pins. The length and width of the leaves determine the size of the hinge.

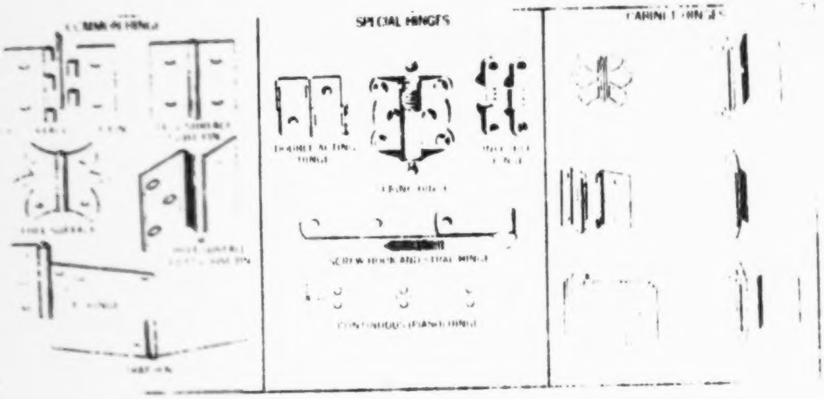


Figure 16. Types of Hinges

Full Mortise

The leaves of a full mortise hinge are completely hidden, leaving only the barrel exposed when the door is closed. A gain (mortise) is required for each leaf. The gain for one leaf is in the edge of the door and the other gain is in the door frame. Because of gains, this type of hinge is one of the most difficult to install. The full mortise hinge looks very much like the full surface hinge, shown at the top of figure 16.

Full Surface

The full surface hinge needs no gain for either leaf. One leaf is screwed to the flat surface of the door and the other leaf is screwed to the frame. The surfaces of the frame and door must be flush if full surface hinges are used.

Half Surface

You will note in figure 16 that the half surface butt type hinge is similar to both of the other hinges. One leaf is fastened on the surface of the door and the other leaf fits into a gain in the frame. The hinges used on passage doors are usually half surface or full mortise butts. The hinges used on fence gates and barn doors, or for other heavy-duty work, are generally full surface T-hinges or full surface strap hinges.

Cabinet Hinges

Cabinet hinges are made in many styles and finishes to provide an adequate selection for every type of cabinet. Full mortise, full surface, or half surface hinges are used for cabinet work. Figure 16 shows a few of the many cabinet hinge designs.

Special Hinges

Many other types of hinges, such as a doubleaction hinge for a swinging door, a loaded hinge for screen and storm doors, invisible hinges, and continuous hinges, shown in figure 16 are also available.

Hinge Hasp

A hinge hasp is like a hinge, but its leaves are made differently. One leaf has screw holes for fastening the hasp in place. The other leaf has screw holes for fastening the hasp in place. The other leaf is longer with a slot cut near the outer end, as shown in figure 17. A heavy metal loop, riveted to a square metal base, is used with the hinge hasp. The base of the loop is fastened in place with four screws. The slotted leaf of the safety hasp covers the heads of all the screws when it is in the locked position.

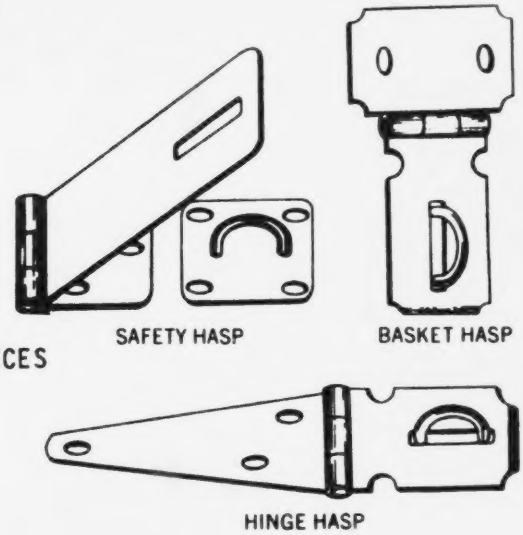


Figure 17. Hinge Hasps

LOCKING DEVICES

Like hinges, locks are also available in a great variety of styles, sizes, and finishes. Three types are in general use: (1) mortise locks, (2) rim locks, and (3) cylinder locks.

Mortise Locks

A mortise type lock, shown in figure 18, is so named because it requires that a deep mortise be cut in the edge of the door. The locking mechanism fits into the mortise when the lock is installed. This type of lock is used primarily on storage rooms. The holding power of this lock is questionable because the deep mortise weakens the door. If the door is forced, the wood can split at the mortise.

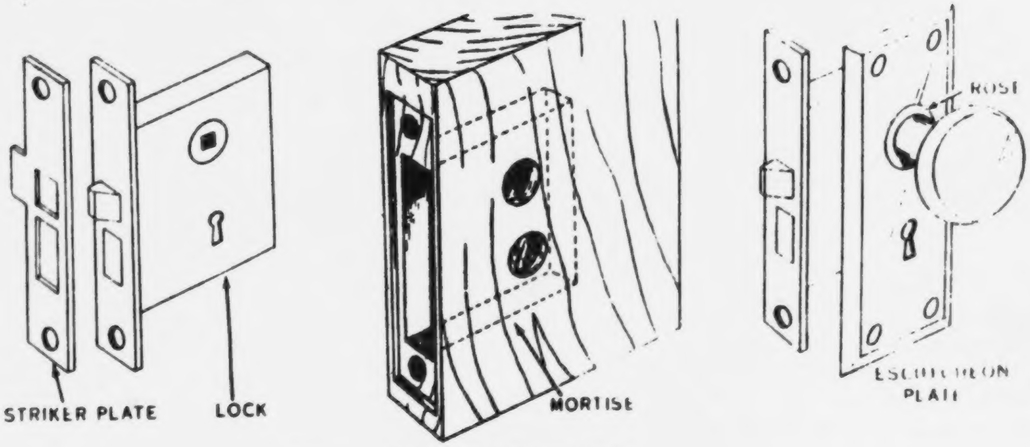

STRIKER PLATE
LOCK
MORTISE
ROSE
ESCUTCHEON PLATE

Figure 18. Mortise Lock

Cylinder Locks

The parts of a cylinder lock are shown in figure 19. The cylinder lock is more dependable than the mortise lock because it requires less wood removal, thus weakens the door less. The lock is easily installed, as it generally requires only two holes in the door of which the larger may be only 1 1/4 inches in diameter. The positioning of the holes is critical and a guide template is usually furnished with the lock for the exact marking of the hold positions. Place the template on the face of the door at the proper height and mark the centers of the holes to be bored. Bore the hole through the face of the door first and then bore the hole into the door edge to receive the bolt. This hole should be slightly deeper than the length of the bolt. Good quality cylinder locks are installed quite frequently on exterior doors.

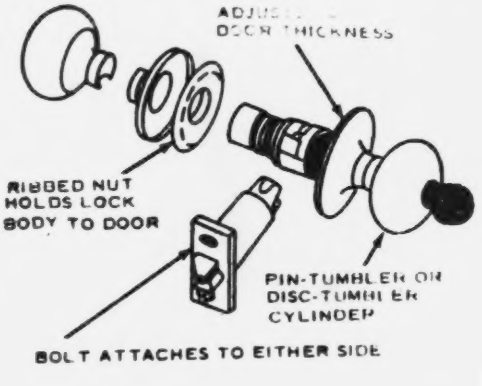

ADJUSTS TO DOOR THICKNESS
RIBBED NUT HOLDS LOCK BODY TO DOOR
PIN-TUMBLER OR DISC-TUMBLER CYLINDER
BOLT ATTACHES TO EITHER SIDE

Figure 19. Cylinder Lock

Rim Locks

The rim lock can be used as the primary locking device on a door, but it is generally used as a night latch, or safety lock, in addition to a mortise of cylinder lock.

Rim locks are easy to install because the locking mechanism is applied to the inside surface of the door with flathead screws or stove bolts. Only one hole is needed to receive the rim lock from the outside face of the door. You can latch un unlatch from the inside of a room by turning the small knob on the locking mechanism. It must be unlocked from the outside with a key. A rim lock is illustrated in figure 20.

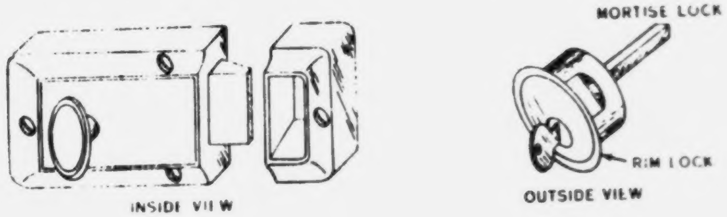


Figure 20. Rim Lock

Friction Catches and Drawer Pulls

Friction catches are used to hold small doors in the closed position. They are not locked with a key. These catches are designed to release their hold when a slight pulling pressure is placed on the door knob or handle. Many designs have been patterned and manufactured, but they all serve the same purpose some of the most common types are shown in figure 21.

Ball and Spring Catch

The ball type catch, shown in figure 21, consists of a barrell holding a steel spring that pushes against a steel ball. This assembly fits into the bottom or top of the door. A beveled striker plate fits into the door frame. These catches are very easy to install because they require only one hole to accomodate the barrell and a small mortise or "gain" for the striker plate.

Prong Type Catch

This type of catch is similar to the ball type catch, but there is no barrel, ball, or striker plate. A specially shaped prong that fits into a spring type hold is fastened to the inside of the door. The holder is fastened to the inside of the cupboard. It clamps over the prong and holds the door closed. The door opens easily with a slight pull.

Elbow Catch

The elbow catch, shown in figure 21, is used when the cupboard or bookcase has a double door. The striker plate is fastened to the underside of a shelf. The catch is fastened to the inside surface of the door so that it hooks over the plate when the door so that it hooks over the plate when the door is closed. The right-hand door must be opened in order to reach behind the left-hand door and release the elbow catch.

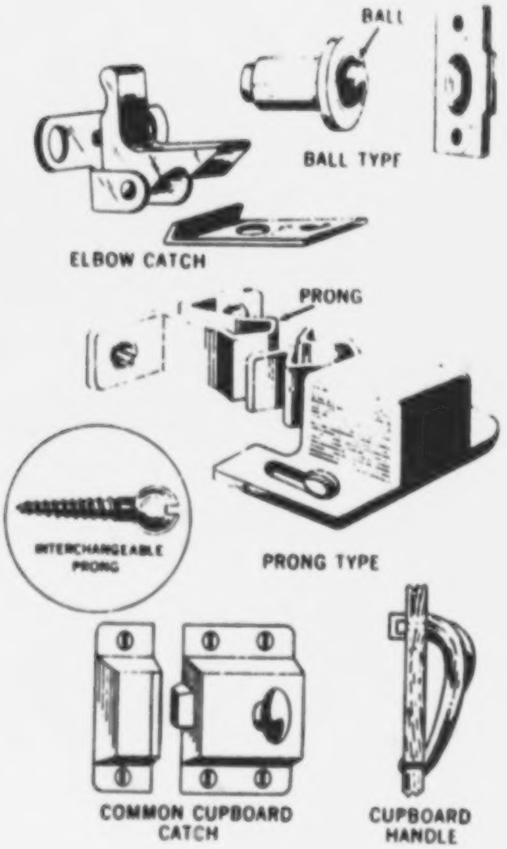

BALL
BALL TYPE
ELBOW CATCH
PRONG
INTERCHANGEABLE PRONG
PRONG TYPE
COMMON CUPBOARD CATCH
CUPBOARD HANDLE

Figure 21. Friction Catches

Cupboard Catch

The most common catch used on cupboards is a simple lock that opens with a knob instead of a key, as shown in figure 21. It can be used on either a single or double door. The lock is fastened to the face of the door and the striker is fastened to the frame of the opposite door. Many other types of catches or handles are available for cupboard doors. The type to use is only a matter of choice. It should, however, match the surrounding fixtures.

Drawer Pulls and Knobs

Drawer pulls or knobs, as illustrated in figure 22, made from either wood or metal, are used for pulling drawers open. They come in such a large variety of sizes, shapes, and designs that it is impossible to discuss them all. Pulls and knobs are usually fsatened with a bolt type fastener that passes through the front of the drawer.

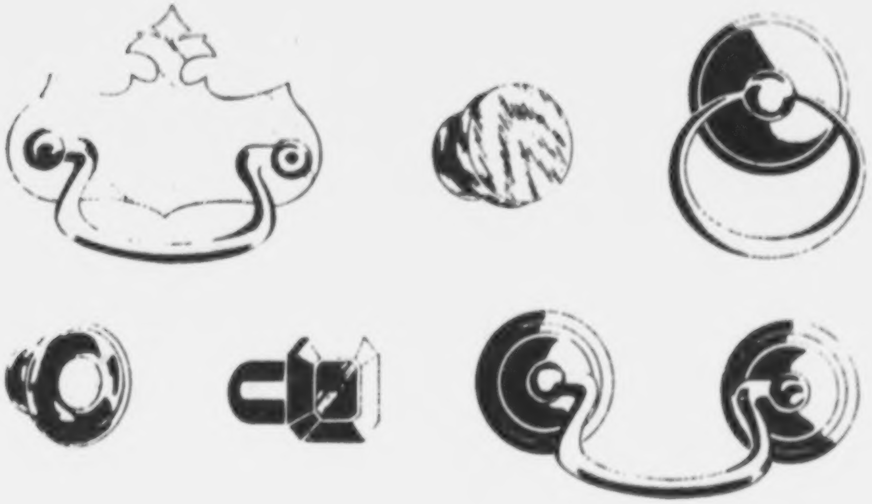


Figure 22. Drawer Pulls and Knobs

MISCELLANEOUS HARDWARE

Many special hardware items are used in building construction. These items are used in building construction. These items are either rough or finish hardware, depending upon their use. A few of these special items are shown in figure 23.

Timber Connectors

Timber connectors are metal devices used to increase the joint strength in timber structures. Efficient connections for either timber-to-timber or timber-to-steel joints are provided by the several types of timber connectors. The appropriate type for a specific structure is determined primarily by the type of joint to be made and the load to be carried.

Shelf Brackets

Shelf brackets vary from very simple angle braces to elaborately scrolled brass brackets. They are made for fastening an open shelf to a wall or for holding adjustable shelves in a cabinet.

Joist Hangers

Joist hangers fasten joists to girders and eliminate toenailing, notching, and shimming. Metal bridging is available to be used between floor joists in the same way as diagonal or crisscross bridging. This type of bridging is easy to install and makes a neat appearing job. It is, however, more expensive than wooden bridging.

Handrail Brackets

Handrail brackets hold the handrail for stairways. They are made in many designs and finishes, but all serve the same purpose. They must be fastened securely to a wall stud or a block installed between the studs. You will become familiar with many other hardware items commonly used by the carpenter as you work with them.

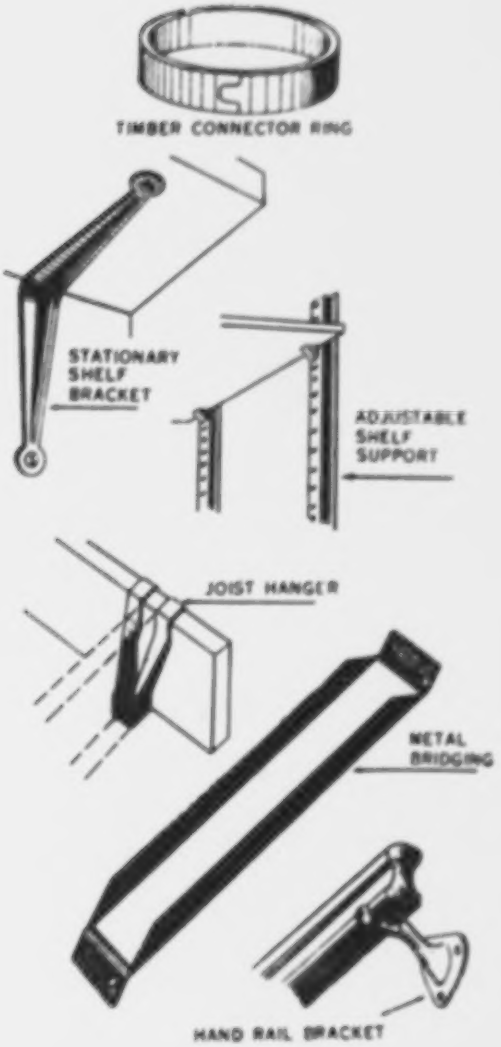

TIMBER CONNECTOR RING
STATIONARY SHELF BRACKET
ADJUSTABLE SHELF SUPPORT
JOIST HANGER
METAL BRIDGING
HAND RAIL BRACKET

Figure 23. Miscellaneous Hardware

DOOR CLOSERS

Door closers are used on outside doors and other doors which are subject to slamming due to drafts. Many models of door closers are available: so you may be expected to install, maintain, adjust, or repair any one of them. Needless to say, it would be impractical for us to try to cover each model specifically in this text. We can, however, provide general overview of the principles of operation and some of the adjustment, repairs, maintenance, and installation procedures you will meet.

Door closers are available in either surface mount or mortise mount. They may operate hydraulically or pneumatically. However, the majority of the closers used for heavy doors operate hydraulically.

Pneumatic

Lightweight doors, such as storm doors and screen doors, normally use penumatic closers. This type of closer is usually surface-mounted. The checking medium is air and the airflow is adjustable by a set screw to control the speed of door closing. An internal spring closes the door.

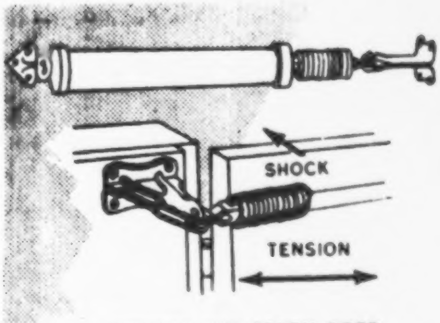


Figure 24. Pneumatic Door Closer

Installation

Due to the many different types available, it is suggested that you follow the manufacturer's instructions when installing this equipment. Figure 24 shows a typical pneumatic closer.

Hydraulic

Heavy doors, wood or metal, in public buildings require heavy duty closers. The hydraulic closer is available in many models. Of course, the model chosen will depend upon the application. Some models are suitable for either left or right-handed doors; however, they must be set up for the correct hand before installation. Other models come only for left or right-hand installation and must be ordered for the specific installation. With these types of closers the door is closed by a spring in the closer and the speed is controlled by the hydraulic fluid. The hydraulic flow is controlled by an adjustable restrictor. Both the spring tension and the hydraulic flow are adjustable, so that the closer can be adjusted to match the door.

Installation

As with the pneumatic closer, the hydraulic closer should also be installed according to the manufacturer's instructions, which will be packed with the unit. In areas of severe weather, especially high winds, it may be necessary for you to reinforce the door and jamb with metal plates to withstand the extra stress encountered. Figure 25 shows a typical hydraulic closer.

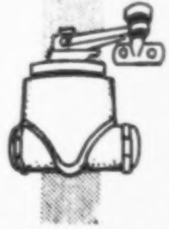


Figure 25. Hydraulic Door Closer

SUMMARY

There are many types of wood available for construction. Often times the type of wood utilized in a project will be determined by the location of your duty station.

The knowledge of different types of hardware and their uses is vital to a carpenters skill. Failure to use the correct hardware or incorrectly installing the right hardware can lead to inferior workmanship and product failure.

QUESTIONS

1. What is the best grade of plywood?

2. What type of nail would you use if you were framing a wall?

3. What is blue stain?

4. What are the three types of wood screws?

5. What type of wood would you use if the wood was going to be subjected to a high moisture level?

REFERENCES

Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.

3700 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-I-6

CONSTRUCTION DRAWINGS

OBJECTIVE

a. Given building plans, determine the type, location, and configuration of carpentry work for the construction of the building.

INTRODUCTION

Getting the right start is the most important aspect of any job. This is especially true when it comes to planning a construction job. For instance, it is obvious how important it is to locate a structure in the proper location. It must also be level and square to be acceptable. To meet these requirements, you must be able to interpret (read) plans and sometimes make working sketches of the project. You can easily interpret drawings if you can visualize the relationship of lines, scales, architectural symbols, site plans, elevation views, and floor plans that compose a set of plans.

INFORMATION

LINES

In order to include all the necessary information on a drawing in a meaningful manner, different types of lines are used to represent the features of an object. The meaning of a line, with certain characteristics, has been standardized and that line will have the same meaning on any drawing. These line conventions must be understood if you are to read drawings. The line conventions most often encountered in construction prints are shown in figure 26.

Visible Lines

A visible line is a heavy, unbroken line used for the primary features of a drawing. For drawings of objects, this line represents the edges, or the surface limit that is visible from the viewing angle of the drawing.

Hidden lines

A hidden line is a medium weight line of evenly spaced short dashes which represent an edge, or the surface limit which is not visible from the viewing angle of the drawing.

Center Lines

A thin (light) line composed of alternate long and short dashes of consistent length is called a center line. A center line is used to signify the center of a circle used to divide an object into equal or symmetrical parts.

Dimension Lines

A dimension line is a solid continuous line ending in arrow heads at each end.

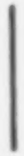
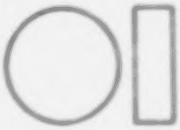
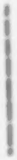
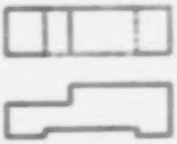
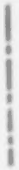
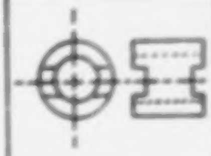
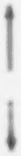
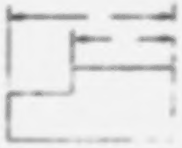
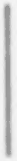
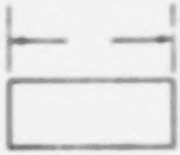
LINE CONVENTIONS			
NAME	CONVENTION	DESCRIPTION AND APPLICATION	EXAMPLE
VISIBLE LINES		HEAVY UNBROKEN LINES USED TO INDICATE VISIBLE EDGES OF AN OBJECT	
HIDDEN LINES		MEDIUM LINES WITH SHORT EVENLY SPACED DASHES USED TO INDICATE CONCEALED EDGES	
CENTER LINES		THIN LINES MADE UP OF LONG AND SHORT DASHES ALTERNATELY SPACED AND CONSISTENT IN LENGTH USED TO INDICATE SYMMETRY ABOUT AN AXIS AND LOCATION OF CENTERS	
DIMENSION LINES		THIN LINES TERMINATED WITH ARROWHEADS AT EACH END USED TO INDICATE DISTANCE MEASURED	
EXTENSION LINES		THIN UNBROKEN LINES USED TO INDICATE EXTENT OF DIMENSIONS	

Figure 26. Line Conventions

Scale

Architectural plans are drawn to scale. It is easy to visualize the impossibility of drawing a building to actual size; therefore, they are drawn in proportional (scale) so they can appear on one sheet. Plans for a residence are normally drawn to a scale of 1/4" = 1'0". This means that every 1/4 inch on the drawing represents 1 foot of actual structure. Thus, if a wall on a drawing is 4 inches long, the wall in reality is 16 feet long. The scale of a drawing is indicated in the title block of a drawing.

Symbols

Symbols are used on construction plans to indicate the type and location of doors, windows, and other features. Often these symbols are the same general shape as the object. For example, figure 27 shows the symbol for an exterior door opening to the inside and the symbol for a double hung window in a frame wall.

Besides being the same general shape as the feature it represents, symbols also show the direction of motion. For example, look at the door symbol again in figure 27. The motion of the window cannot be shown because it is in a direction perpendicular to the page.

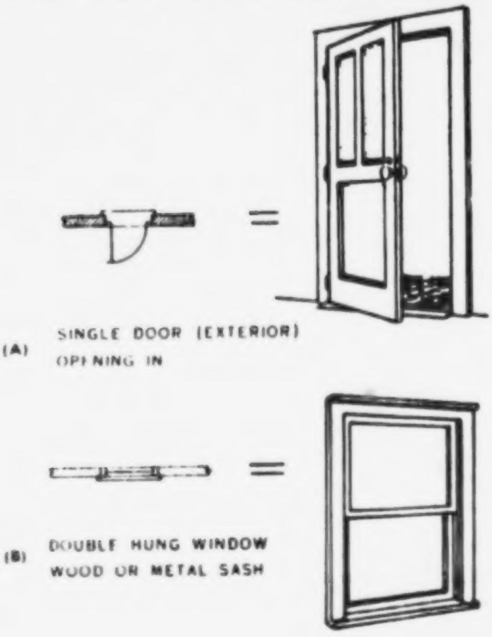

=
(A) SINGLE DOOR (EXTERIOR) OPENING IN
=
(B) DOUBLE HUNG WINDOW WOOD OR METAL SASH

Figure 27. Architectural Symbols for a Door and a Window

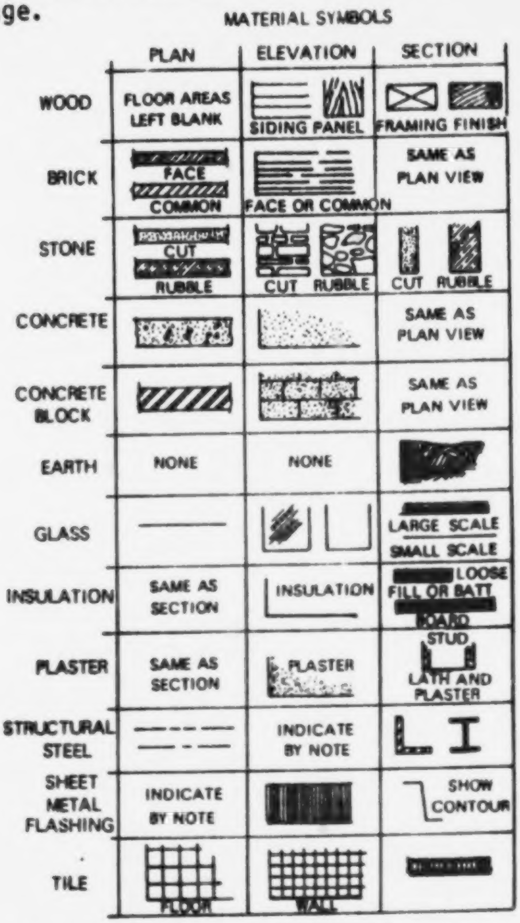
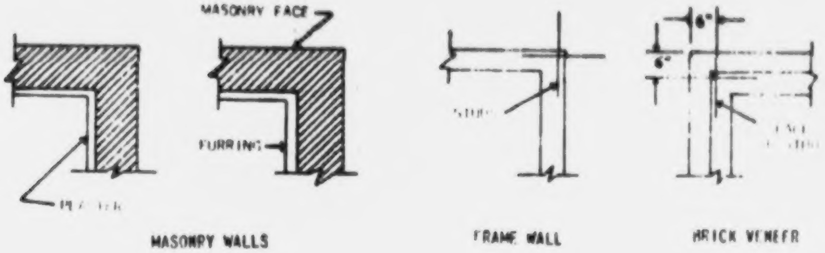
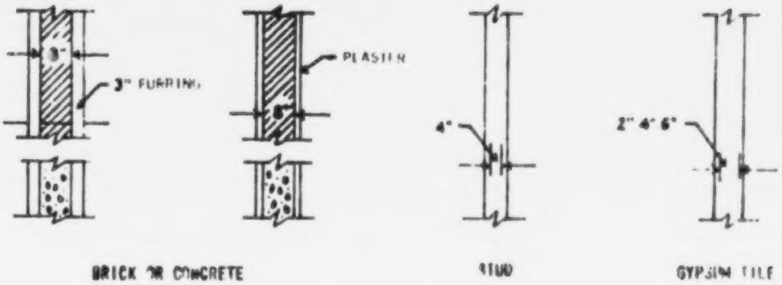

MATERIAL SYMBOLS
PLAN
ELEVATION
SECTION
WOOD
FLOOR AREAS LEFT BLANK
SIDING
PANEL
FRAMING
FINISH
BRICK
FACE
COMMON
FACE OR COMMON
SAME AS PLAN VIEW
STONE
CUT
RUBBLE
CUT
RUBBLE
CUT
RUBBLE
CONCRETE
SAME AS PLAN VIEW
CONCRETE BLOCK
SAME AS PLAN VIEW
EARTH
NONE
NONE
GLASS
LARGE SCALE
SMALL SCALE
INSULATION
SAME AS SECTION
INSULATION
LOOSE FILL OR BATT
BOARD
PLASTER
SAME AS SECTION
PLASTER
STUD
LATH AND PLASTER
STRUCTURAL STEEL
INDICATE BY NOTE
SHEET METAL FLASHING
INDICATE BY NOTE
SHOW CONTOUR
TILE
FLOOR
WALL

Figure 28. Symbols for Materials



EXTERIOR WALLS



INTERIOR WALLS

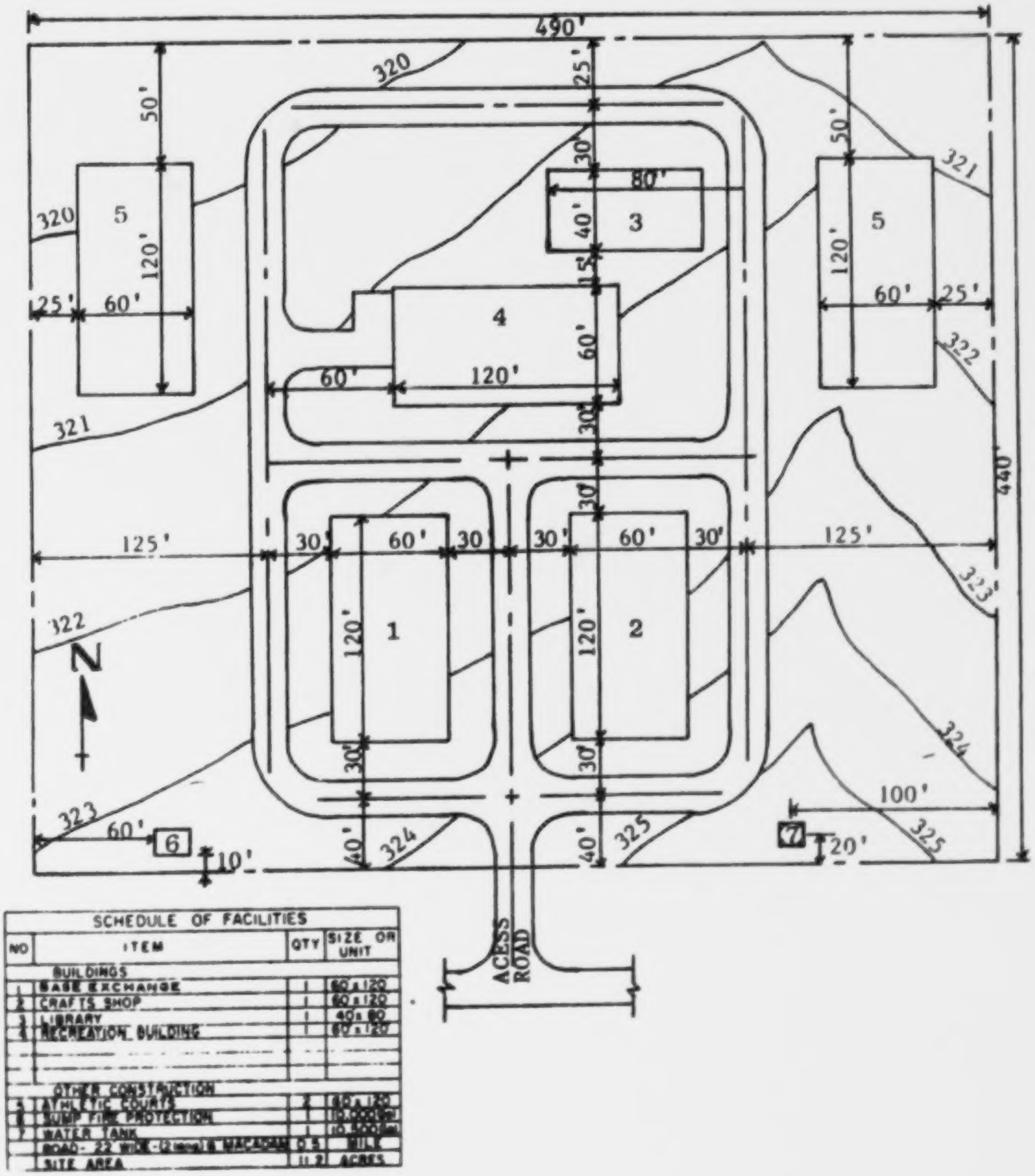
Figure 29. Typical Wall Symbols

The type of material used for construction also indicated in figure 28 shows material symbols, while figure 29 shows typical wall symbols used in construction drawings. Look again in figure 26 and see how these material symbols are used in conjunction with object symbols. Detail A in figure 27 shows the door located in a brick wall while detail B shows a window in a wood frame wall. You should become familiar with material symbols to help you interpret construction drawings.

Site Plans

The site plan, as shown in figure 30, is sometimes referred to as the plot plan. The site plan shows the property lines, ground contours, and loation of the building in relation to existing structures or other facilities. The site plan is oriented with a north-pointing arrow to indicate north. Each facility on the plan has a number (or code letter) designation by which it is identified in the schedule of facilities. Refer to the schedule of facilities in the lower left-hand corner of figure 30.

The contour lines on the plot plan indicate the elevation of the earth's surfaces. All points on each contour line have the same elevation. Distances are given between principle facilities and reference lines. The center lines on figure 30, from which distances to the various facilities are given, are center lines of the roads surrounding the area. Note also in figure 30, that the overall size of the proposed facility is given in the schedule of facilities


490'
440'
320
321
322
323
324
325
25'
50'
30'
80'
40'
15'
120'
60'
125'
100'
20'
10'
1
2
3
4
5
6
7
N
ACESS ROAD

SCHEDULE OF FACILITIES			
NO	ITEM	QTY	SIZE OR UNIT
	BUILDINGS		
1	BASE EXCHANGE	1	60 x 120
2	CRAFTS SHOP	1	60 x 120
3	LIBRARY	1	40 x 80
4	RECREATION BUILDING	1	60 x 120
	OTHER CONSTRUCTION		
5	ATHLETIC COURTS	2	60 x 120
6	SUMP FIRE PROTECTION	1	10,000gal
7	WATER TANK	1	10,500gal
	ROAD- 22 WIDE-(2mm)6 MACADAM	0.5	MILE
	SITE AREA	11.2	ACRES

Figure 30. A Typical Site Plan

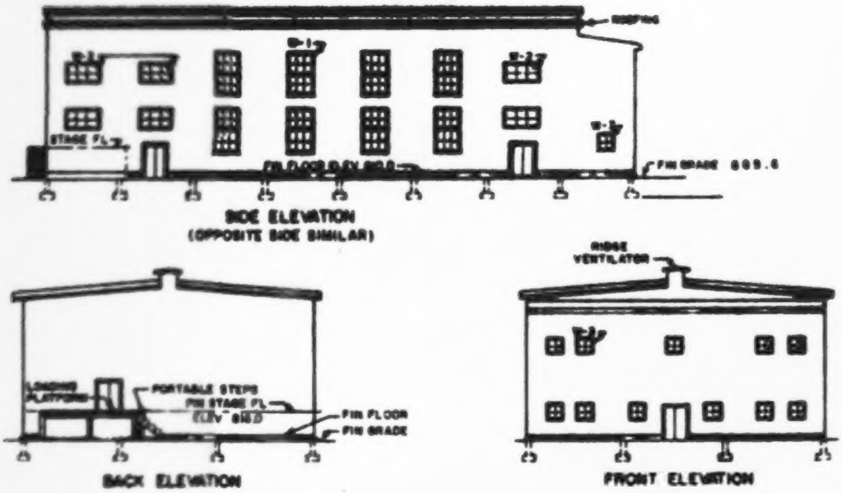

ROOFING
W-1
W-2
W-2
W-3
STAGE FL
FIN FLOOR ELEV 810.0
FIN GRADE 809.6
SIDE ELEVATION
(OPPOSITE SIDE SIMILAR)
RIDGE VENTILATOR
W-3
LOADING PLATFORM
PORTABLE STEPS
FIN STAGE FL
ELEV 813.0
FIN FLOOR
FIN GRADE
BACK ELEVATION
FRONT ELEVATION

Figure 31. Typical Elevation Views

Elevations

Elevations are plans showing the front, rear, or side view of a building or structure. Figure 31 shows typical elevation views of a recreation building. Sometimes, the construction materials are indicated on the elevation. It usually shows the ground level surrounding the structure. The ground level is referred to as the grade. When more than one view is shown on a sheet, each view is identified by a title.

Elevation views show the location and character of doors and windows. In figure 31, the window types are marked W-1, W-2, and W-3. Their identifying marks refer to a particular size window whose dimensions are given in a table known as the window schedule. In some drawings, the rough opening dimensions of windows and doors are given on the drawing.

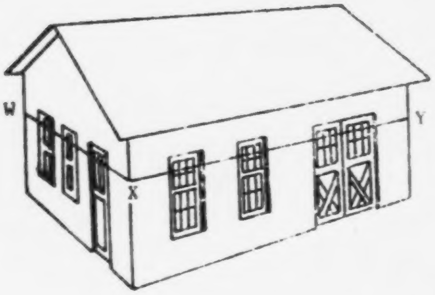
Note also in figure 31 that the building shown has two double doors on each side and a double door at each end. The elevation also shows you that at the end of the building with the loading platform, the double door is at the level of the stage door and all of the other doors are at grade level.

Floor Plans

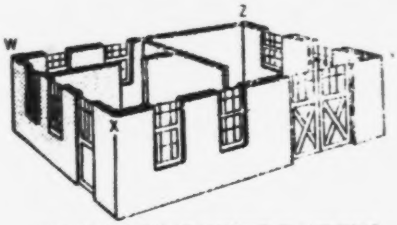
The floor plan is a cross-sectional view of a building. The horizontal cut crosses all openings, regardless of their height from the floor. Figure 32 shows the development of a floor plan. A typical floor plan is shown in figure 33. Note that a floor plan shows the outside shape of the building and the arrangement, size, and shape of the rooms. Floor plans also show the type of material, as well as the length and thickness of the building walls. In addition, it includes the type, width, and location of the doors and windows and locations of utility installations.

By examining the floor plan, you can see that the interior of the building consists of an auditorium, a lobby with a BX counter, a men's toilet, a ladies' toilet, a projection room on a second floor level above the lobby, two dressing rooms, and a stage. The plan gives the dimensions of the area specified.

Note also that the building entrance and/or exit doors are the same type (ID) and that all windows are double-hung type. All interior doors (2D) are the same and the two double doors (3D) open into the lobby from the auditorium.



VIEW OF A BUILDING SHOWING CUTTING PLANE WXY



PREVIOUS VIEW AT CUTTING PLANE WXYZ, TOP REMOVED

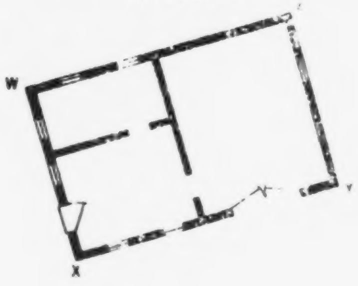


Figure 32. Development of a Floor Plan

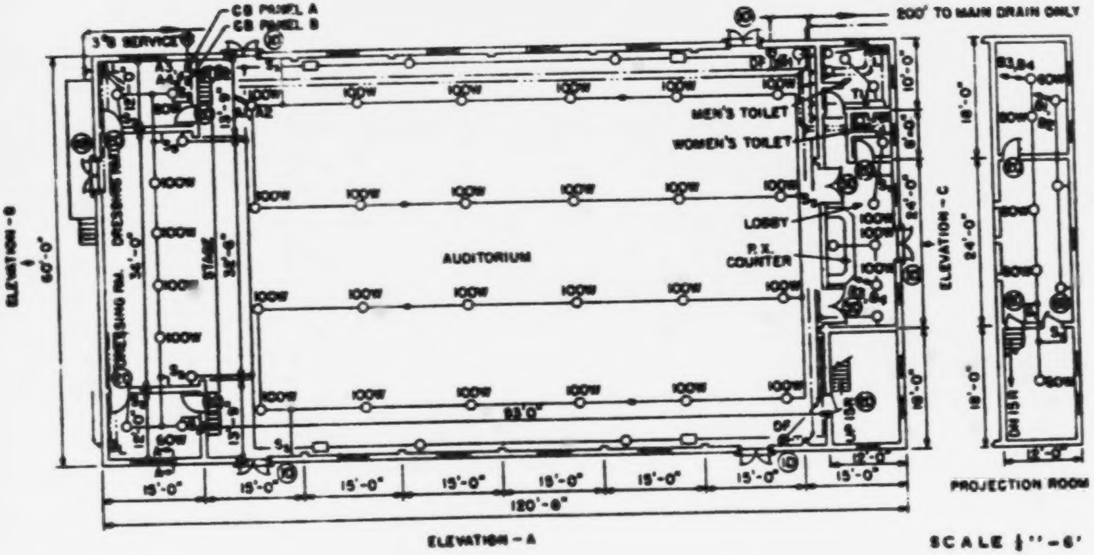

CB PANEL A
CB PANEL B
3 Ø SERVICE
200' TO MAIN DRAIN ONLY
MEN'S TOILET
WOMEN'S TOILET
LOBBY
P.X. COUNTER
AUDITORIUM
DRESSING RM.
DRESSING RM.
STAGE
36'-0"
36'-0"
100W
60W
93'0"
ELEVATION - B
60'-0"
ELEVATION - C
10'-0"
8'-0"
24'-0"
16'-0"
16'-0"
24'-0"
16'-0"
12'-0"
12'-0"
15'-0"
15'-0"
15'-0"
15'-0"
15'-0"
15'-0"
15'-0"
15'-0"
120'-6"
ELEVATION - A
PROJECTION ROOM
SCALE ⅛"-6'

Figure 33. Typical Floor Plan

SUMMARY

This study guide has covered a small portion of the items that can be learned from drawings. As you progress through the Air Force or at a civilian job, this knowledge will give you the basis for more information you will need to know. The day will come when you will be in charge of a job and have the responsibility of seeing that it is done properly. Having the knowledge of what you've just covered could make the difference.

QUESTIONS

1. What is the purpose of a site plan?

2. How can you determine from a drawing whether a door opens inward or outward?

3. What is the purpose of an elevation view?

4. On which drawing will you be able to find the sizes of interior rooms?

5. What type of line is used to show part of an object that cannot be seen?

REFERENCES

Textbook: Modern Carpentry, The Goodheart-Willcox, Co., Inc.

3700 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-I-7

HAND TOOLS

OBJECTIVES

a. Given illustrations and statements pertaining to hand tools, identify the hand tools, their use, and the maintenance required. Twenty of thirty responses must be correct.

b. Given procedures, materials, hand tools, and machines, clean and lubricate the hand tools/machines as necessary with no more than two instructor assists.

c. Given handtools, procedures, equipment and working as a member of a team shape and sharpen the hand tools IAW procedures with no more than three instructor assists.

INTRODUCTION

A craftsman is judged by the tools he keeps. Likewise, he is judged by the condition of his tools. You already know how important it is to have good quality tools and equipment to do a good job. It is equally important to keep carpentry tools and equipment in good operating condition by using proper cleaning, storing, repairing, lubricating and sharpening techniques.

Woodworking tools are built sturdily and will last a long time with proper care and maintenance. First, you will study the proper procedures for cleaning, treating, and storing tools. Then you will study how to make minor repairs to tools and equipment and how to lubricate them. Lastly, you will learn how to sharpen various types of tools.

SAWS

Handsaws can be divided into two general classes - one for cutting parallel to wood grain or "ripping" and one for cutting at right angles to wood grain or "crosscutting". The size of the saw is determined by the length of the cutting edge in inches. Usually the crosscut or ripsaw is from 18 to 26 inches in length. The number of teeth points determines coarseness of the saw. The number of points per inch of blade is printed on the blade of new saws. The blade of a handsaw should have a light coating of oil on it at all times to prevent rust and to lubricate it while cutting. On all handsaws, every other tooth is bent slightly in opposite directions. This is called set. The purpose of having set in a saw is to produce a cut, "kerf", that is slightly wider than the thickness of the saw blade.

The kerf helps to guide the saw and keep it straight after starting the cut. The type of material that you saw will determine the amount of set that is necessary to keep your saw from binding. More set is required to saw a wood with high-moisture content than is required for a dry wood.

Boards that are to be cut should be placed on a saw horse(s) and "marked off" for the piece that is to be removed. The saw cut should be started on the waste side of the line by making a few upward or pulling strokes. You should then make several short, forward strokes until the kerf is deep enough to prevent the saw from slipping out. You must be careful during this process to prevent cutting your thumb should the saw accidentally come out of the starting kerf. Long, even strokes are used after the saw cut has been started. The full length of your saw should never be used as the cutting progresses. The cutting will usually be fast enough if you use a slight amount of pressure on the saw. A beginner finds it much easier to stay on the line and produce a square cut when little pressure is applied. Excess pressure is referred to as riding the saw and should always be avoided.

You can hold the saw in two different ways; one way is to hold the saw with the four fingers looped through the handle. The best way is to loop three fingers through the handle and extend yur index finger along the side of the saw to serve as a guide as shown in figure 34.

Ripsaw

The general appearance of a ripsaw and crosscut saw are the same. The arrangement of the teeth, however, is the major difference. The number of teeth points on the ripsaw is usually 4 1/2 or 5 1/2 per inch on a ripsaw blade. The teeth are chisel shaped because they easily cut along the wood grain as shown in figure 35. The teeth are filed at right angles to the blade from both sides of the saw. You should not use a ripsaw for cutting across wood grain because the wood fibers are torn leaving a rough cut.

Crosscut

The number of points on a crosscut saw is usually 8 to 11 teeth points per inch of blade. The crosscut teeth are filed with both sides of the teeth on an angle as shown in figure 36. Crosscut saws, as the name implies, are designed to cut across wood grain.

Backsaw

A backsaw has a thin blade that is reinforced with a steel strip along the top edge as shown in figure 37. It is often referred to as a miter saw because longer saws of this type are used in a miter box as shown in figure 38. The saw itself has fine teeth (14 to 16 points per inch) and produces a very smooth-finished cut. Primarily, the backsaw is used with the miter box for interior finish work.

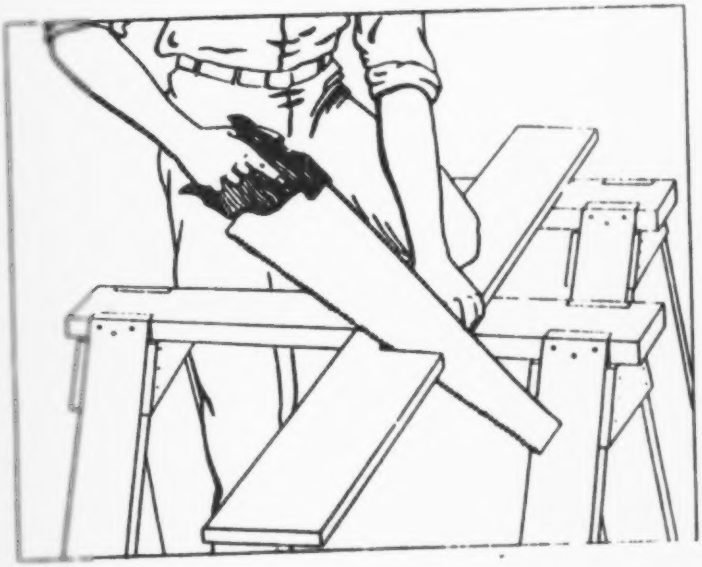


Figure 34. Crosscutting With a Handsaw

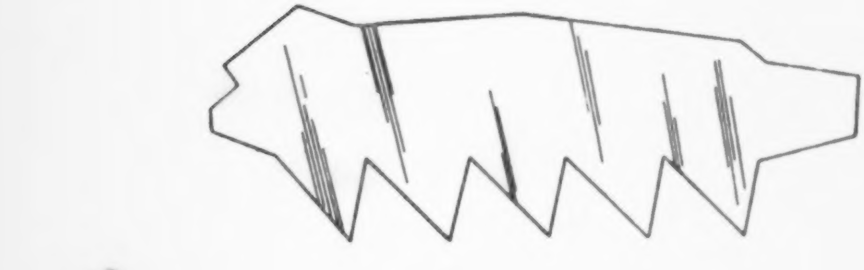


Figure 35. Set-in Saw Teeth (Ripsaw)

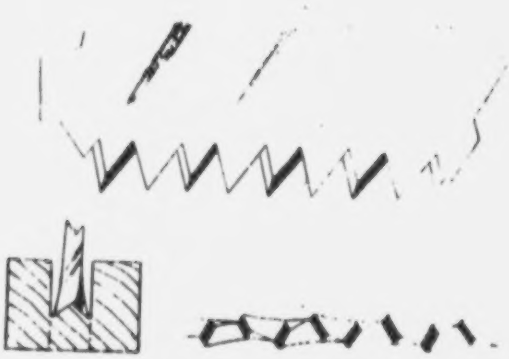


Figure 36. Set-in Saw Teeth (crosscut saw)

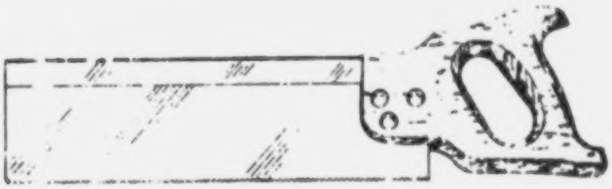


Figure 37. Back or Miter Saw

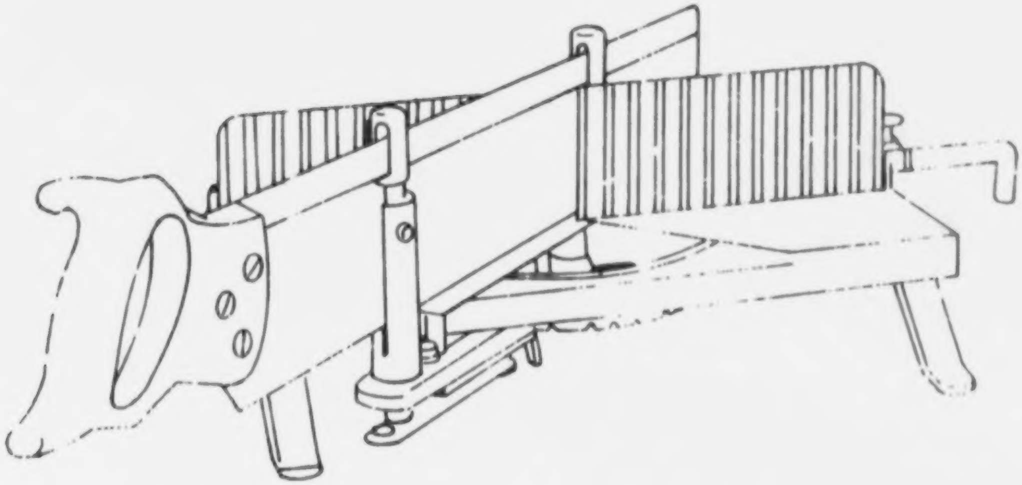


Figure 38. Miter Box

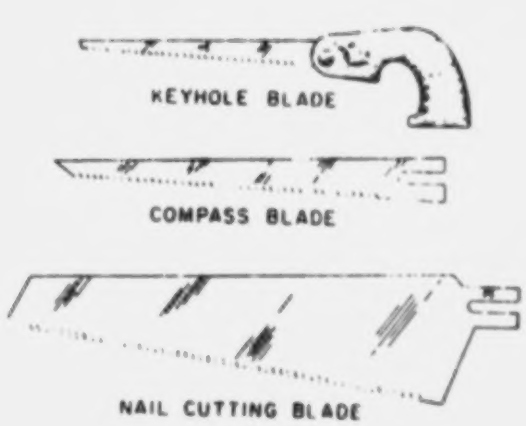


Figure 39. Nested Saws

The miter box is a device that accurately guides the saw blade and can be adjusted to cut various angles. You can cut miters for moldings, picture frames and other forms of interior or exterior trims.

Nest of Saws

A nest of saws is a set of different saw blades that can be used in the same handle. Figure 39 shows the three blades most commonly used by a carpenter. A "nested saw" can be purchased with a complete set of blades but, in most cases, the keyhole saw or compas saw is purchased by your base as a single saw. The keyhole saw and compass are almost identical. The only difference is that the compass saw blade is wider. The primary use of both the keyhole and compas saw is for cutting an opening in gypsum board for electrical outlets.

Coping Saw

The coping saw, shown in figure 40, is made up of a C-shaped metal frame that holds different types of narrow (usually 1/8"-wide) blades. The blade is fitted to the frame by loosening the handle and attaching the blade to the pin on the front of the saw frame and the pin on the saw handle. By tightening the handle, tension is applied and holds the blade in place. The blade should be placed on the frame with the teeth pointing upward toward the handle. The coping saw is designed for cutting very sharp inside or outside curves, usually on thin wood stock. Inside curves must have a hole through the stock for inserting the blade to start the cut.

The coping saw is often used for making corner joints for molding in a building that doesn't have square wall corners. The finished joint looks like a mitered corner, but one piece of the molding is "coped" to fit over the other piece as shown in figure 41.

PLANES

Hand planes are among the most often used maintenance tools. Most lumber used by a carpenter is dressed on all four sides at the factory or mill. When you perform jobs such as fitting doors, repair sliding window "sash" units, or install interior trim, you will often use hand planes.

Parts of a Hand Plane. The principal parts of a "bench" plane and the manner in which they are assembled together is shown in figure 42. The handle located at the rear of the plane is contoured for easy grasping when you push the plane. The knob at the front of the plane is shaped so that it easily allows you to control the direction of cut when using a plane. The main body of the plane, consisting of the bottom, sides, and sloping part that holds the plane iron, is called the frame. The bottom of the frame is the sole and the opening in the sole through which the blade is placed is called the mouth. (NOTE: The sole may be either smooth or have a series of grooves cut into it extending the length of the plane.) The front end of the sole is referred to as the toe and the rear end is called the heel.

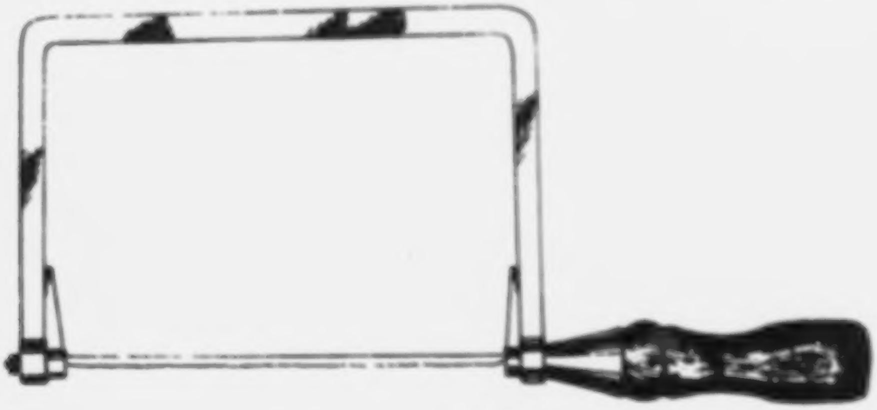


Figure 40. Coping saw

The plane iron cap is screwed to the upper face of the plane iron. The cap forces the wood shavings upward and through the mouth of the plane. This keeps the mouth from becoming choked or jammed with wood shavings. The bottom end of the plane iron cap should be set back 1/32 to 1/16 inch from the bottom edge of the plane iron. The irons in "bench" planes are placed in the frame with the bevel of the plane iron down (as shown in fig. 42). The edge of the plane iron is moved into the desired cutting position by moving the adjusting nut or the lateral adjustment lever. By turning the adjusting nut, you move the plane iron up or down in the frame.

The lateral adjustment lever cants or leans the plane iron to the right or left in the frame as shown in figure 43.

To adjust a plane, hold the plane upside-down and sight along the sole from the toe end and work the adjusting nut until the edge of the blade appears through the mouth. You can then move the lateral adjustment until the edge of the blade is aligned with the sole as shown in figure 44, B and C. Continue using the adjusting nut to give you the amount of blade protrusion that you need. The amount of blade depth, depends upon the depth of cut that you want to make.

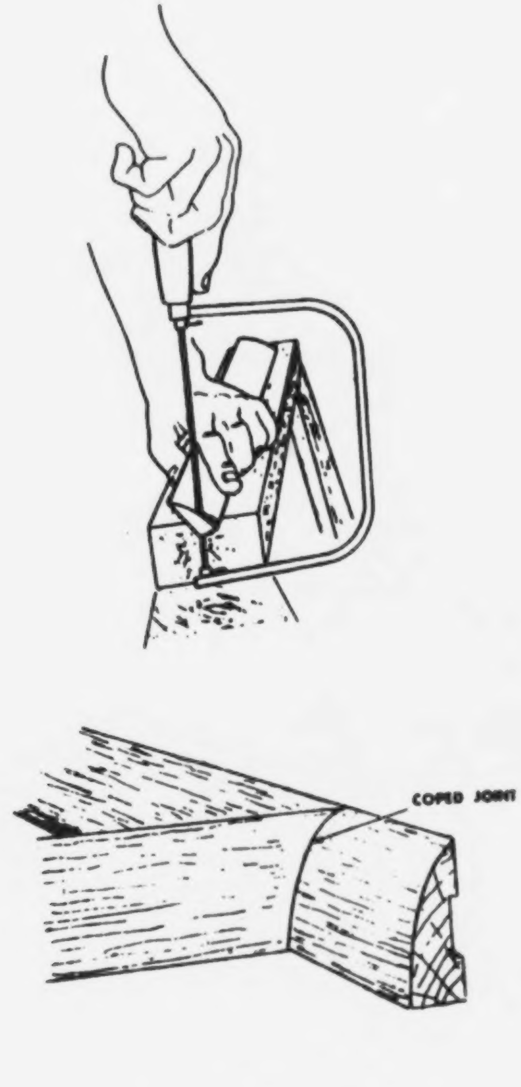


Figure 41. Coped Joint

Types of bench planes. There are three types of "bench" planes that you will use as a carpenter. They are: (1) smooth plane, (2) jack plane and, (3) jointer (fore) plane. All three bench planes are used primarily for shaving and smoothing wood grain. They differ only in the length of the sole. The sole of a smooth plane is (8-9 inches long) the jack plane (14 inches long) and jointer or fore plane (18 to 24 inches long). You will find that the longer the sole of a plane, the more uniform, flat and true is the surface cut that the plane produces. Which bench plane you select for a job depends upon the requirements for the finish of the wood surface.

Smoothing Plane

Generally, a smoothing plane, shown in figure 45, is recommended when you have to make surface cuts on wide pieces of wood. When surface-planing wood, you should examine the wood to determine the direction of the wood grain. You must plane with or along the grain and across it to produce a smooth surface. If the wood tears, it shows that you are planing against the grain, that the board has a twisted grain pattern or your plane has a dull cutting edge. Wood grain direction is shown in figure 46. You should always try your plane on a scrap piece of wood to see if it is sharp and properly adjusted before using it.

Jack Plane

The jack plane, shown in figure 47, is perhaps the most commonly used type of bench plane. It can take a deeper cut and plane a truer surface than a smooth plane. The jack plane is used for all-purpose projects and considered a favorite of most craftsmen.

Jointer/Fore Plane

The jointer plane, is the longest of bench planes. It is used when the true straightedge is required. An example is a door, when the sides of a door must be trued, the jointer plan would be the best plane to use. It is also used to plane straightedges of long pieces of woodstock that are to be glued together.

Edge Planing

When planing lumber, you should select the best of the two outside edges of the lumber and determine the direction of the wood grain. Next, you should clamp the board in a bench vise close to the edge of the board, as shown in figure 48 and plane along the edge holding your plane level at a slight angle to the edge. Begin planing the board until you obtain a continuous shaving along the length of the board. You should then check the length of the board's edge for accuracy with a straightedge as shown in figure 49. Once you have obained a square straightedge on one side of the board, you can lay out a desired width from the straightedge side and draw a line along the length of the board. Then, you plane the second edge side of the board to this line.

Block Plane

The block plane, shown in figure 50, measures between 6 to 7 inches in length and is made to be used with one hand, while the other hand can be used to hold your work. The blade of the block plane is mounted in the frame at a low angle and the beveled edge of the blade is turned upward. Figure 51 shows the parts of a block plane.

NOTE: There is no plane iron cap as used with bench planes. The main use of the block plane is cross-grained squaring of end-stock. The block plane can also be used to plane smooth surfaces on small pieces of work.

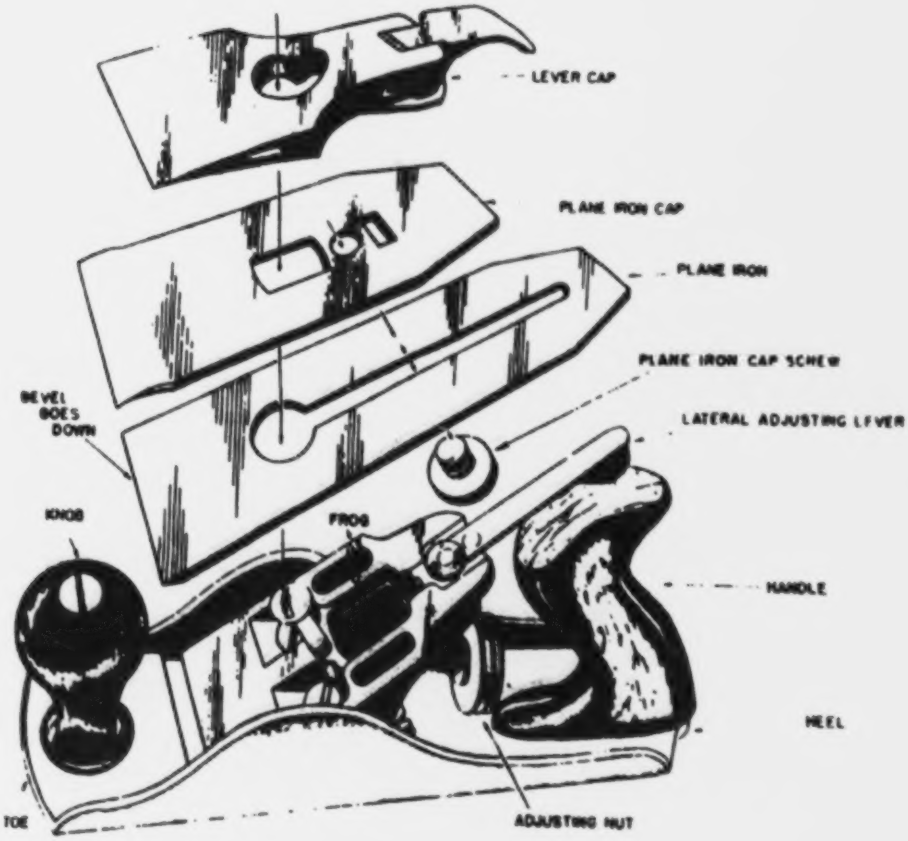

LEVER CAP
PLANE IRON CAP
PLANE IRON
PLANE IRON CAP SCREW
BEVEL GOES DOWN
LATERAL ADJUSTING LEVER
KNOB
FROG
HANDLE
HEEL
TOE
ADJUSTING NUT

Figure 42. Parts of a Bench Plane

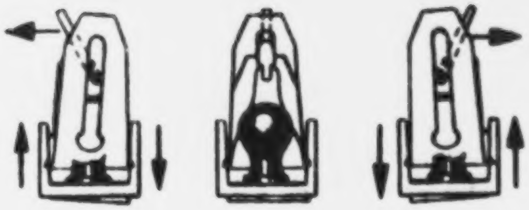


Figure 43. Movement of Lateral Adjustment Lever

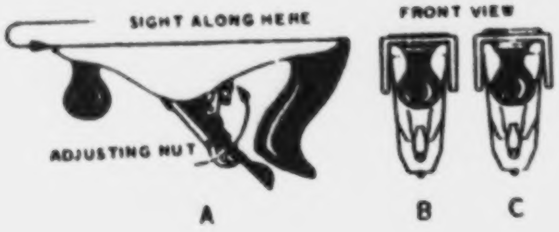

SIGHT ALONG HERE
FRONT VIEW
ADJUSTING NUT
A
B
C

Figure 44. Movement of Adjusting Nut

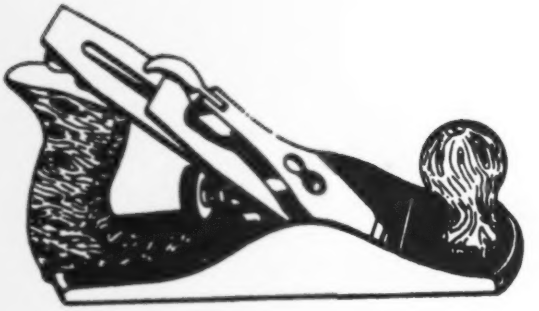


Figure 45. A Smoothing Plane

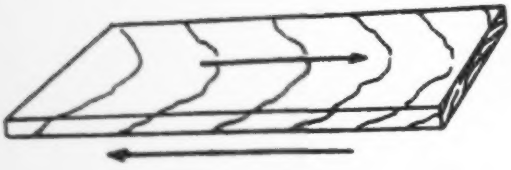


Figure 46. Wood Grain Direction

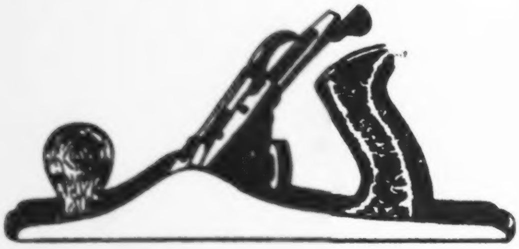


Figure 47. The Jack Plane

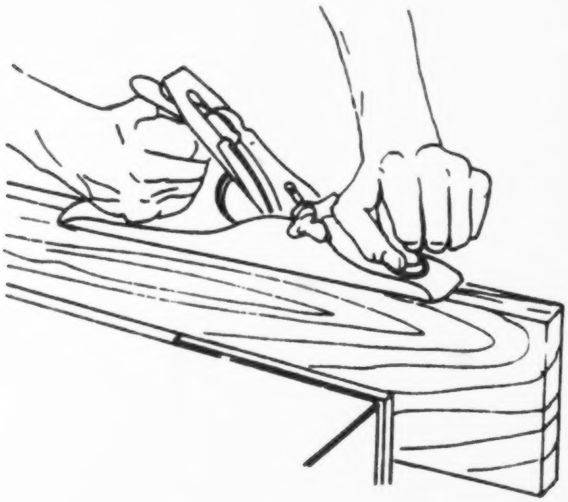


Figure 48. Edge Planing a Board

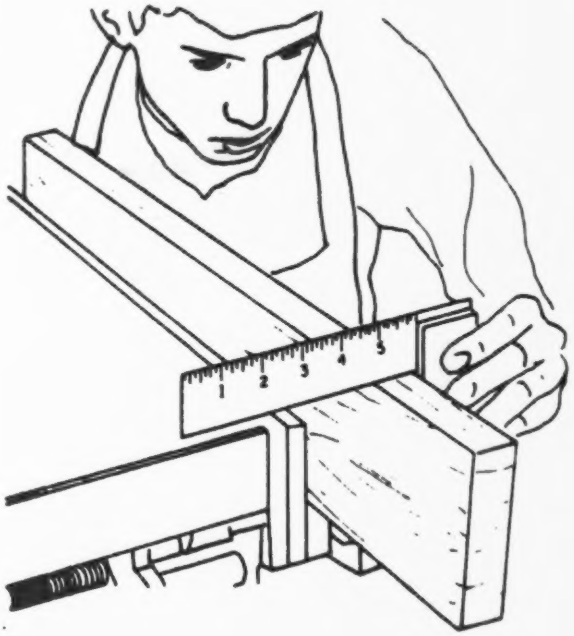


Figure 49. Checking For Squareness

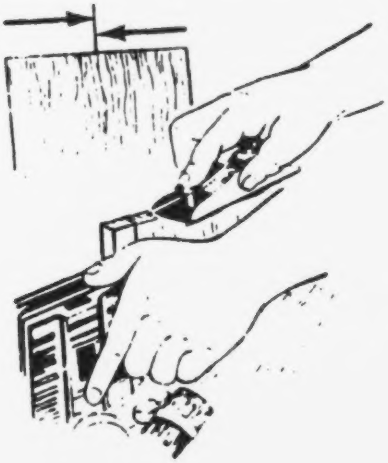


Figure 50. Using Block Plane

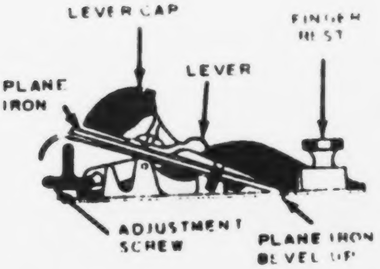

LEVER CAP
FINGER REST
LEVER
PLANE IRON
ADJUSTMENT SCREW
PLANE IRON BEVEL UP

Figure 51. Parts of a Block Plane

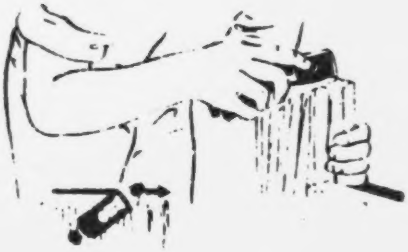


Figure 52. Planning a Bevel or Chamfer

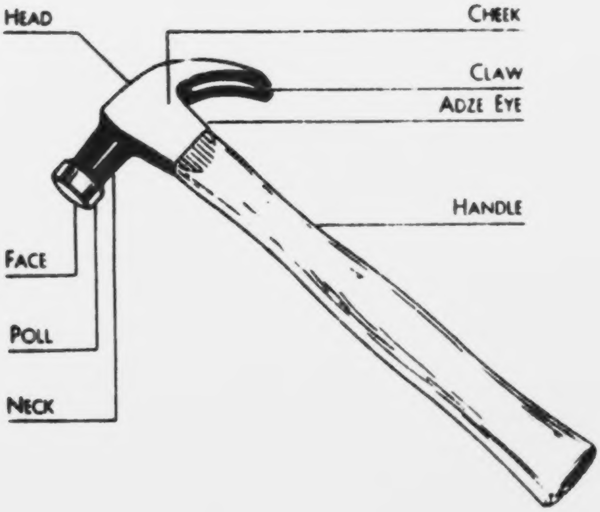

HEAD
CHEEK
CLAW
ADZE EYE
HANDLE
FACE
POLL
NECK

Figure 53. A Standard Claw Hammer

Planing End-Grain

End-grained planing of a board requires the use of a sharp plane to remove thin shavings.

The block plane, because of its design and size, is most often used for this purpose. You should begin the end-grained planing by marking a square line across the end of your wood stock. Clamp the wood stock into a vise as near the layout as possible. Adjust the block plane to make a fine cut and, holding the plane level, use light, uniform hand pressure and push the plane toward the middle of the board. The cut should then be finished from the opposite side of the board. You must be careful not to plane across the ends of the board from one direction; if you do, this will result in splintering of the corners of the board. You can prevent corners from splintering by placing a scrap piece of lumber against one side of the board as shown in figure 52.

Planing Bevels and Chamfers

A chamfer is made with a hand plane by cutting an angle part way across the edge of a piece of wood stock as shown in figure 52. The bevel is an angle cut made across the entire edge of a piece of wood stock. Bevels or chamfers are laid out with a marking gauge around the outside edges of a board.

Two sets of lines are required for a chamfer; one set, extends along the edges of the board, and the other is laid out on the board's surface. Once you have laid out the lines, plane the ends of the board first. In the event that the board splinters along the edges, the splintered area can be removed when you plane the edges of the board.

HAMMERS

These groups of tools are used to drive nails, staples, wooden stakes and other driving tools such as the mallet, which is used to strike other tools. The parts of a standard claw hammer are shown in figure 53. In this section, we are going to discuss the different types of hammers that you will encounter as a carpenter and the use of each type.

Straight Claw Hammer

This type of hammer is also called a ripping hammer (see fig 54), the most often used type of hammer. For general or all-around rough work, it should weigh 20 ounces. NOTE: The size of a hammer is based upon the weight of the head. The steel used in the hammer head must be of a quality that its face will withstand contact with hard surfaces without chipping or marring. The claw must be sharp enough for pulling nails and the handle capable of absorbing shock instead of transmitting it to your arm. This will prevent your arm from tiring after long periods of use. Shock absorption is prevented by using a hammer with wooden handles, or a steel or fiberglass handle that has rubber or neoprene handgrips. Figure 55 shows the correct method of holding a straight-claw hammer. Straight-claw hammers are excellent tools for removing siding or other building materials because of the head design. Figure 56 shows a straight-claw hammer being used to remove wall sheathing from an old building.

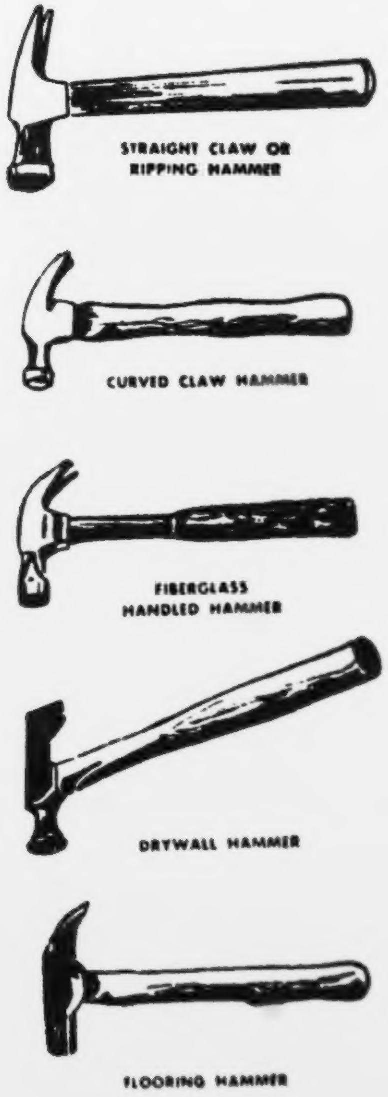

STRAIGHT CLAW OR RIPPING HAMMER
CURVED CLAW HAMMER
FIBERGLASS HANDLED HAMMER
DRYWALL HAMMER
FLOORING HAMMER

Figure 54. Types of Hammers

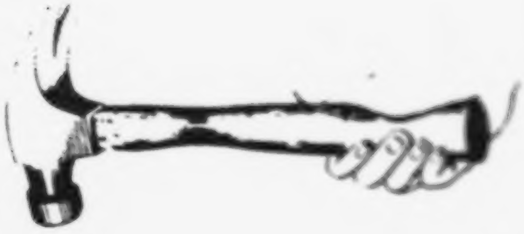


Figure 55. Correct Method of Holding a Hammer

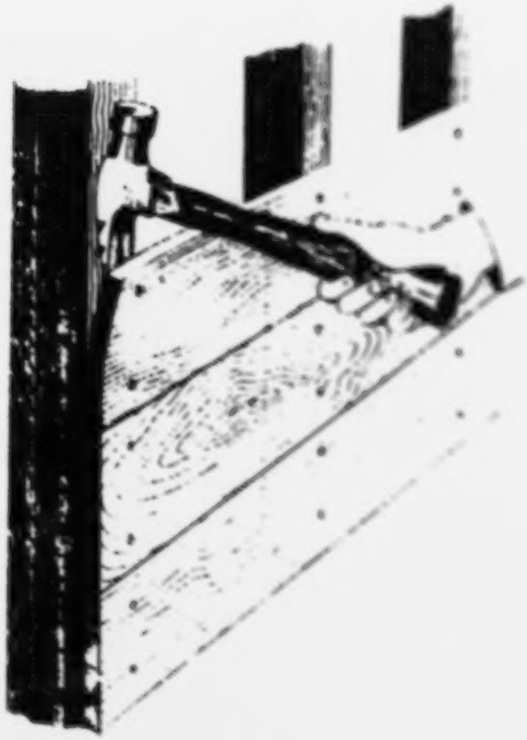


Figure 56. Removing Siding With a Straight-Claw Hammer

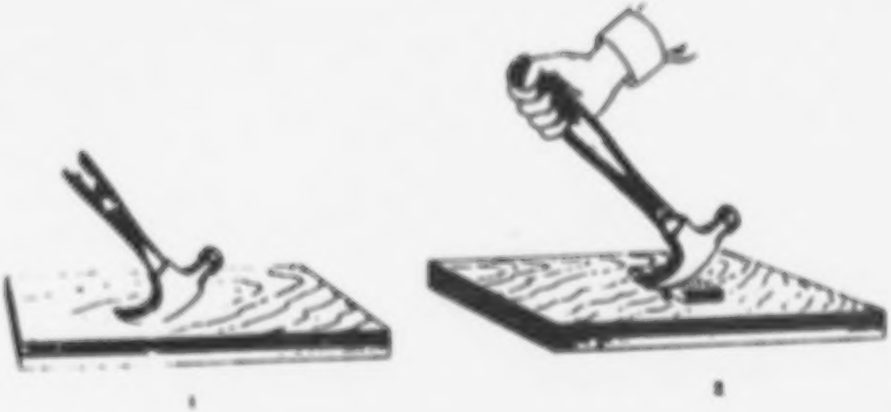


Figure 57. Pulling Nails With a Curved-Claw Hammer

The face of a straight-claw hammer may be either smooth or serrated. A serrated face on a hammer can cause damage to the wood when nailing and you should not use this type of hammer for finish work. The advantage of a serrated head hammer is that when doing rough work (building-framing), the head is less likely to slip and bend nails. The weight of the straight-claw hammer results in fewer blows being required to drive nails.

Curved Claw Hammer

This hammer is frequently used by carpenters for finish work and is available in weights ranging from 7 to 20 ounces. The 13-ounce curved-claw hammer is the most popular for general purpose carpentry work. As mentioned earlier, the straight-claw hammer is the type used the most, but curved-claw hammers are the most common and best suited for pulling nails. Figure 57 demonstrates the ease of pulling nails with a curved-claw hammer. NOTE: In figure 57 there is a piece of scrap wood placed under the head of the hammer. This is done with either a straight-or curved-claw hammer and reduces the chances of breaking the hammer handle.

Drywall Hammer

The drywall hammer shown in figure 54 is a specifically designed hammer used for the application of gypsum board. (NOTE: It is sometimes referred to as a drywall hatchet). The face of the drywall hammer is designed so that when you strike the finish blow to a nail, it dimples the surface without breaking the paper. The top of the drywall hammer can be used as a gauging device to obtain distance between sheets of drywall or to pull nails because of the V-shaped notch cut into the rear of the blade of the hammer head.

Flooring Hammer

The flooring hammer shown in figure 54 is shaped much like a curved-claw hammer with two exceptions: (1) the face of the hammer head is larger, and (2) the claws are wider. As the name implies for this hammer, it is used for installation of flooring, both wood subfloors and finish floors. The wide claws allow you to remove pieces of flooring a lot easier than with standard claw hammers. Generally, the appearance of this hammer is rare on an Air Force base, but it is possible that you may encounter this tool.

Tack Hammers

The tack hammer (fig 58) is designed specifically for nailing tacks. A magnetic-head tack hammer allows you to place the tack head on the head of the hammer and then start to drive the tack into the wood without hitting your fingers.

Sledge Hammer

The double-faced sledge hammer as shown in figure 59, will weigh between 2 to 20 pounds and have handles from 15 to 36 inches in length. They are used by a carpenter when driving wooden stakes for construction of wood concrete forms for the foundation of a building or wall. Small sledge hammers are used for driving spikes (extra large nails), or with cold chisels for cutting pieces of metal. When driving wooden stakes for a building, you should use a 6-pound sledge hammer. (NOTE: Sledge hammers are designed for striking wood or metal and should not be used for breaking rock or concrete. A store sledge often referred to as a napping hammer shown in figure 60, is used for these purposes).

Mallets

There are many different types of mallets used by a carpenter as shown in figure 61. Many different weights and handle lengths can be obtained for different types of jobs. A wooden or rawhide mallet should be used for driving wood chisels. The rubber mallet is used for striking nailing machines. A neoprene- or plastic-head mallet has heads that are screwed on and can easily be replaced. This mallet is very useful for general shop work if used properly, because you can strike a wood surface without damaging it.

Hatchet

There are three different types of hatchets shown in figure 62. Of these, two types, the half hatchet, and shingle hatchet are the safest types to use when driving nails. A shingle hatchet is used for applying roof shingles. It has a double-bevel blade and a series of holes drilled into the front side of the cutting blade. The holes are used with a gage pin to measure the amount of shingle exposure when you lay roof shingles as shown in figure 63.

Half Hatchet

The half hatchet is a combination chopping and driving tool. It has a wooden handle and a steel head consisting of a hammer face and blade. The blade has a notch located on its rear side which can be used in pulling nails smaller than 8d (2 1/2 inches), in length. The hatchet is used most effectively when chopping with the grain of the wood.

Wood-Boring Tools

Several carpenters can be given the same materials and tools to build an identical project, but some of the projects will usually have a better finished appearance than others. This is due partially to understanding the different characteristics of materials and individual skills. By using a wood-boring tool and bit, you can bore holes before driving nails that will prevent the wood from splitting and control direction of the nails. Special bits are available that can be used to countersink (drive below the surface) wood screws. Other types of bits can be used as screwdrivers for fastening wood screws. During this section we will discuss these wood-boring tools and bits.

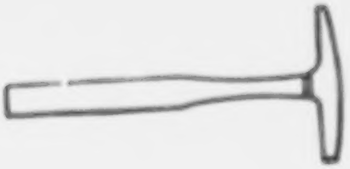


Figure 58. Tack Hammer

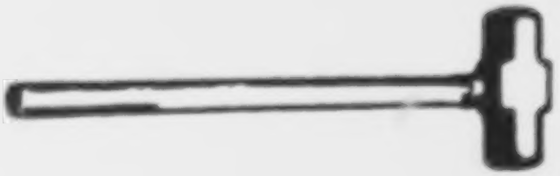


Figure 59. Sledge Hammer

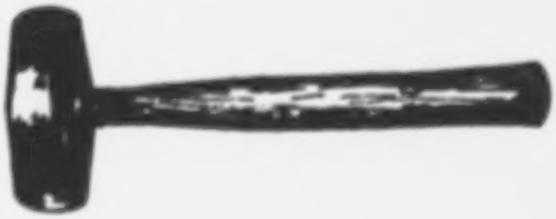


Figure 60. A Store Sledge or Rippling Hammer

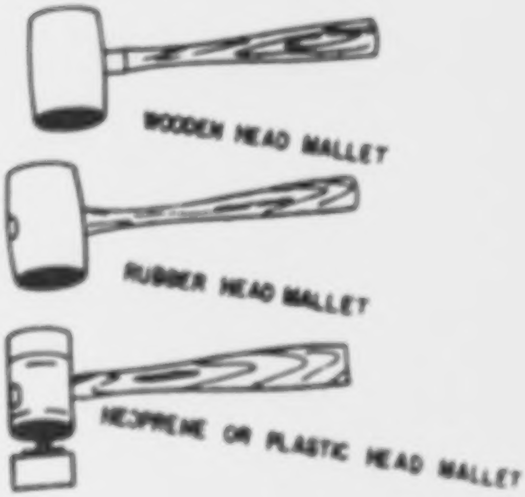

WOODEN HEAD MALLET
RUBBER HEAD MALLET
NEOPRENE OR PLASTIC HEAD MALLET

Figure 61. Types of Mallets

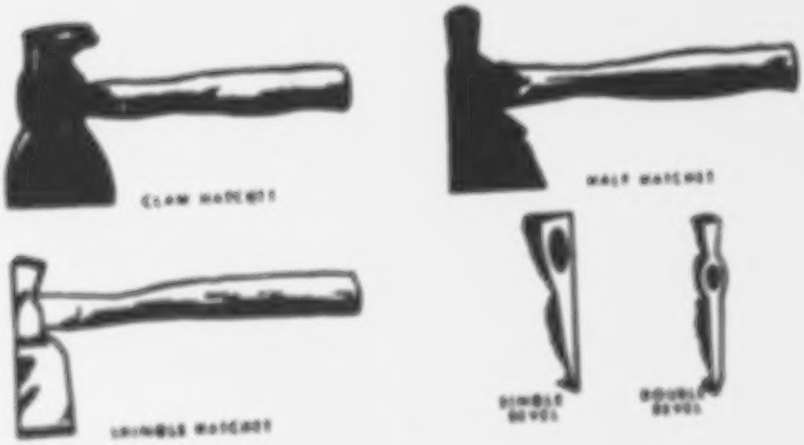

CLAW HATCHET
HALF HATCHET
SHINGLE HATCHET
SINGLE BEVEL
DOUBLE BEVEL

Figure 62. Types of Hatchets

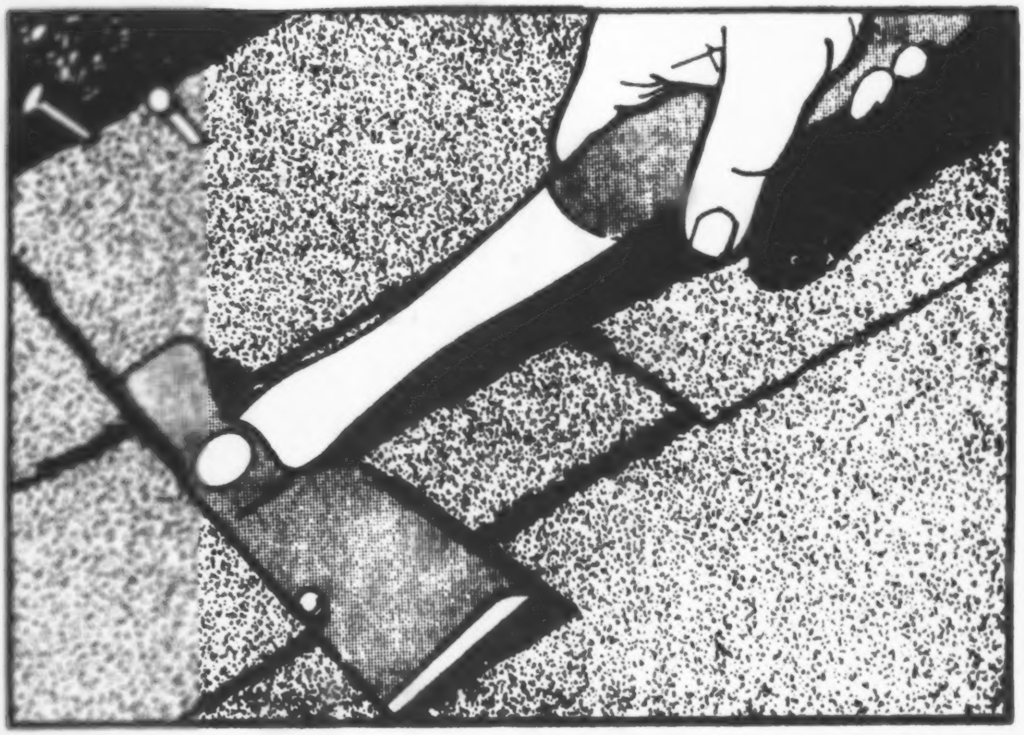


Figure 63. Using a Shingle Hatchet

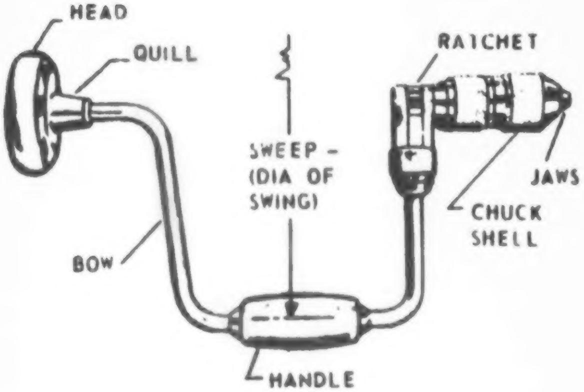

HEAD
QUILL
RATCHET
SWEEP - (DIA OF SWING)
JAWS
CHUCK SHELL
BOW
HANDLE

Figure 64. A Ratchet-Brace

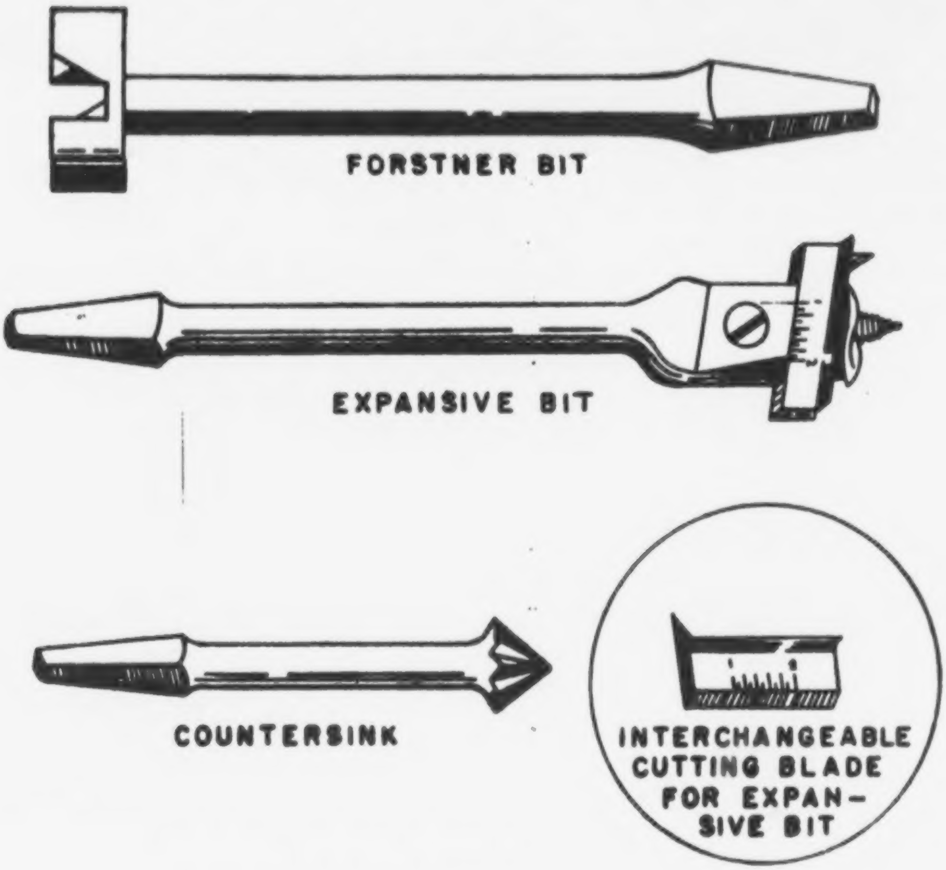


Figure 65. Types of Bits Used in a Ratchet-Brace

Ratchet-brace

A ratchet-brace could be used when boring holes in wood. It can be used to turn auger bits, expansive bits, countersink bits, and screwdriver bits. The parts of a common ratchet-brace are shown in figure 64. For average carpentry work, a ratchet-brace with a 10-inch sweep is most commonly used. Sweep refers to the diameter of the circle made when you make a complete turn of the brace handle. You do not have to make a complete circle with the ratchet-brace because of the ratchet system built into the front of the brace. You can easily work in corners or near joining walls after learning to use the brace.

BITS

Figure 65 shows some of the different types of bits that can be used in a ratchet-brace. You should notice that each type of bit used in the ratchet-brace has a tapered, straight sided end piece which is called a tang. The tang stops the bit from slipping in the ratchet-brace should you encounter knots, hard pieces of wood, or have a dull cutting bit.

Auger Bits

The auger bit shown in figure 66 is used with the ratchet-brace to bore holes in wood. The common sizes of auger bits range from 1/4 to 1 inch in diameter, with larger sizes available for special purposes. The number found on the tang of an auger bit shows the size of the bit. Sizes of an auger bit are indicated in 1/16 inch, an example being that a 1/4-inch auger bit would have the number 4 stamped on the tang, a 1-inch bit would have the number 16.

There are three feed-screw cutting threads available for auger bits; fine, medium, and coarse. How fine or how coarse the feed screw is determines the speed of the auger bit. A fine screw thread is recommended for slow finish work, such as during door lock-set installation, and a coarse thread for fast rough work, such as bolt holes.

Expansive Bits

The expansive bits were also shown in figure 65. When issued an expansive bit, you should receive the bit and two cutters. Expansive bits are used to bore large-diameter holes. One of the two cutters is used for hole sizes from 7/8 to 1 1/2 inches in diameter and the other cutter is used for holes up to 3 inches in diameter.

DRILLS

Hand Drills

A hand drill as shown in figure 67 is used to drill holes 1/4 inch or less in diameter in wood, or metal. The hand drill serves the same purpose as a ratchet brace, but the chuck is gear driven with a hand crank. Bits used in the hand drill are of the twist drill type and have a smooth (no tang) round shank. Some types of hand drills will have a detachable side handle. Other brands of hand drills will have hollow handles that can be used to store drill bits and may be of a type that you can change the speed gear for slow or fast turning speeds.

Push Drills

A push drill can be used to make holes in wood, fiber, plastic or soft metals. The push drill is most often used for the installation of finish hardware. You can use the push drill with one hand and hold the work with the other hand. When you push down on the handle of the push drill, it rotates the drill bit. When you release the pressure of the downward stroke, a spring inside the push drill causes it to return to its original position. The drill bits used in a push drill have a specially shaped shank that fits into the chuck of the push drill. Several size drill bits from 1/16 inch to 11/64 of an inch are usually stored inside the handle. Because of the turning motion (backward and forward rotation), the bits have straight flutes or grooves along two sides of the bit.

LAYOUT TOOLS

When you layout any project, it's important that it be accurate to help in reducing waste. During project layout, if you arrange the materials as they will be needed and measure the pieces correctly, you'll save both time and materials later on during construction.

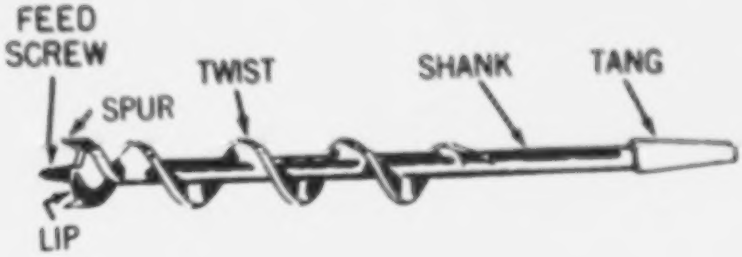

FEED SCREW
SPUR
TWIST
SHANK
TANG
LIP

Figure 66. Parts of an Auger Bit

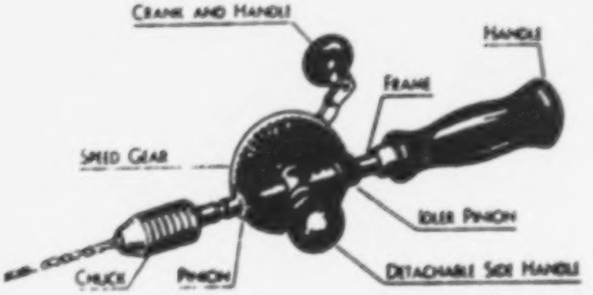

Crank and Handle
Handle
Frame
Speed Gear
Idler Pinion
Detachable Side Handle
Chuck
Pinion

Figure 67. A Hand Drill

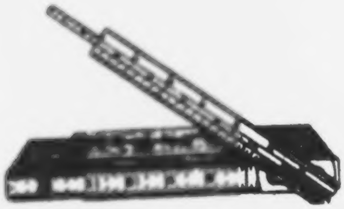


Figure 68. A Folding Rule

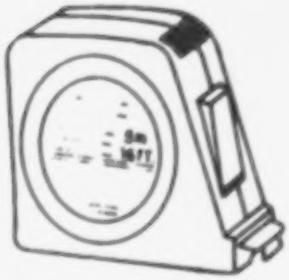


Figure 69. A Pocket Tape

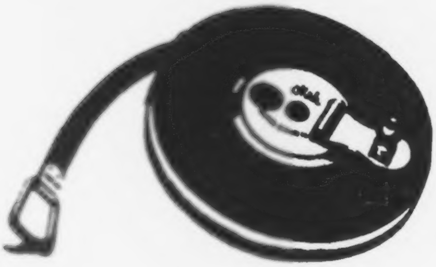


Figure 70. A Steel Tape

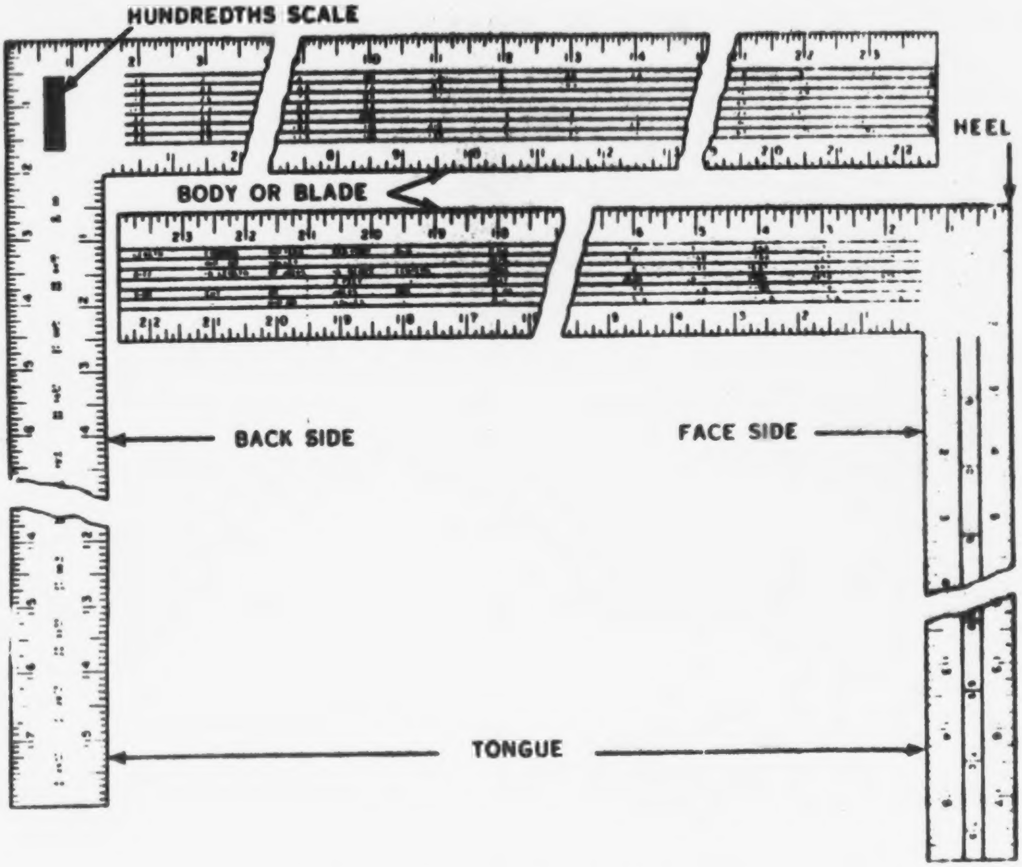


Figure 71. The Framing Square

Folding Rules

A folding rule as shown in figure 68 is made of wood and has either a rivet or concealed-hinge joint that holds it open. Folding rules usually are 6 feet in length and are marked off in feet and inches broken down into sixteenths of an inch. When a rigid measuring tool is needed to extend across wide openings, the folding rule is an excellent tool to use. The slideout extension on a folding rule allows you an additional 6 inches when measuring. The slide-out extension can also be used for other purposes, such as measuring the depth of holes you drill, and inside measurements.

Pocket Tape

A pocket tape as shown in figure 60 is available in 6-, 8-, 10- and 12-foot-or-longer lengths. It is the most commonly used measuring tool by a carpenter. The widths of a pocket tape will vary from 1/2 to 3/4 inch, or 1 full inch. The flexibility of the tape blade allows you to measure round as well as straight objects. Both edges of a tape blade (upper and lower), are marked into inch readings. Each foot of the tape will also be marked and for every 16 inches of tape blade, you will find additional markings. These are placed on the tape to assist you in laying out walls for a building.

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The case of a pocket tape is exactly 2 inches wide. When making inside measurements, the 2-inch length of the case is added to the reading shown on the blade for your total measurement. If the blade of your pocket tape becomes dirty or wet, it should be wiped clean with a light coat of machine oil. After you clean the blade, it should then be wiped dry with a clean cloth.

Steel Tape

A steel tape shown in figure 70 is used mainly for bulding layout. It is available in 25-, 50-, and 100-foot lengths. It is narrower in width than the pocket tape and a hand crank is used to wind the blade up into the case. The blade has either a metal loop or hook on the end to hold the blade in position when unwinding. The blade of the steel tape is marked in 1/8 inch and foot markings. It is also marked every 16 inches for wall and roof layout. You should clean the steel tape in the same manner as a pocket tape.

NOTE: To avoid ruining the steel-tape blade, you must avoid excessive bending or twisting, "kinking" of the blade.

Framing Square

In construction work such as erecting the framework for a building, a framing square is an invaluable tool. Figure 71 shows the framing square and its main parts. The blade of the square is the widest and longest member; the tongue is shorter and narrower. The face is the side that is visible on both the blade and tongue when you hold the square with the tongue in your left hand and the blade pointing to the right. The square most often used by carpenters will have a 16-inch-long tongue and a 24-inch-long blade. The different markings in the center of the square are tables and scales which will be covered later in this volume.

The square is one of the most commonly used tools during building layout and erection. It is used to check materials for squareness, or for layout of roof rafters, which form the skeleton of a building's roof. As you progress in this course, you will become more familiar with the framing square and have the opportunity to study its many uses in more detail.

Try Square

The try square can be used to check the ends of lumber so that you can insure that the ends of a board are 90°. It can also be used to check interior finish work, such as inside and outside corners of cabinet drawers, making sure that the sides and ends of the drawers are square. A try square shown in figure 72 consists of two parts; the head and blade. Blade length ranges between 6 to 12 inches and the size of the head (handle), 4 1/2 to 8 inches in length. The head of a try square usually is made of wood, and the edge of the head toward the blade is faced with a brass plate to protect the wood from damage. Usually, the blade of a try square is broken down into 1/8 inch.

Combination Square

A combination square shown in figure 73 is an all-steel tool consisting of two major parts; the blade and the handle. The 12-inch long blade is grooved or slotted on one side, and allows you to move the handle to different positions. With the handle removed, the blade can be used as a rule or a straight edge. A spirit level is installed in the head, and permits it to be used as a level. A scriber is also inserted into the head. It has a small cap nut and is similar in design to a finish nail. The scribe is really handy when laying out work, if you don't have a pencil. The blade and handle of the combination square are designed so that you can easily layout 45° and 90° angles, or it can be used to draw parallel lines as shown in figure 74. A combination square performs many functions and can be used as a rule, square, depth gauge and level.

Carpenter's Level

The carpenter's level shown in figure 75 can be made of wood, aluminum or magnesium. A carpenter's level 24 or 28 inches in length is most commonly used and usually will have three vials. The vial tubes are filled with a nonfreezing liquid and have a small amount of air trapped purposely inside the sealed tube. When the slightly curved tubes (vials) are placed lengthwise, they are used to "level" or check horizontal surfaces. When installed crosswise in the level, they are used to "plumb" or check vertical surfaces. Figure 76 shows how a bubble is located between the lines on a vial when leveling a surface. It is important that, when leveling or plumbing a surface, the bubble always be centered between these two lines and not tilted as shown in figure 76. Also, note in this drawing that the vial is placed toward the top of the level. Levels of this type can easily be read through the top and are recommended for floor work. When working at or above eye level, you should always use a level that can be read through the sides as shown in figure 75.

Chalkline

A chalkline and reel as shown in figure 77 is used to strike straight lines on a surface. You can use the chalkline to lay out exterior walls, interior partition walls, or on the surface of a roof, when installing roof shingles. To use the chalkline, first you must check and be sure that there is enough powder in the case to give the string a good coating of chalk when the string is pulled from the reel. The line is then pulled from the reel and placed upon the surface area you wish to mark.

NOTE: The line should be pulled very tight, the line is then pulled straight up from the center and released, allowing it to spring back into place which results in a straight well-marked area. If you have to lay out lines for long distances, three people usually will be required. The third person should go to the approximate center of the area to be laid out and place a finger of the right or left hand on the line. With the free hand, they should then snap the line on opposite sides of where their finger is located. Remember that the line must be pulled straight up and released.

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Failure to do so will result in a slight contour in the layout line. The chalkline should only be "snapped" once during layout. Snapping the line several times will result in a series of lines, making the line difficult to follow when you begin your project. Figure 78 shows you the correct and incorrect methods of snapping a chalkline.

CHISELS

In carpentry, a chisel is a very valuable tool but is often the most abused of tools. They are designed for cutting wood surfaces and you should never pry open a container with a chisel or try to use it as a screwdriver. A chisel is a flat piece of steel (of varying thickness and widths) with one end ground to a bevel to form a cutting edge. There are two basic kinds of wood chisels and they are the socket and tang as shown in figure 79. A socket chisel is designed for heavy work with its handle tapered to fit into a cone-shaped recess on the end of the chisel blade. The socket chisel, usually is driven with mallets. A tang-type chisel blade tapers to a point called a tang on the top end of the blade and is driven into the handle. A tang chisel is used for light carpentry work.

You can use wood chisels to shape or trim wood and make different types of wood joints. Wood chisels are available in widths from 1/8 to 2 inches but usually a carpenter will most often use a 3/8th, 1/2, 3/4, or 1 1/4 inch wood chisel. If you are required to make deep cuts, you should use a soft-faced hammer or mallet when driving chisels. When finishing wood joints, trimming, or shaping wood, you should turn the beveled side of a chisel up as shown in figure 80. When making concave cuts as shown in figure 81, or for cutting to depths, you should turn the beveled side of the chisel down for better control of the tool.

Butt Chisel

A butt chisel is shown in figure 82A. It has a short blade and the entire length of the blade and chisel handle will range between 7 to 9 inches. The butt chisel is designed for use in hard-to-get-at places and is the most commonly used chisel for installing hinges on a door.

Mortising Chisel

The mortising chisel shown in figure 82B has a narrow blade that is designed for chiseling out narrow, deep openings in thick pieces of wood. This type of work requires a good bit of effort, the chisel is used as a lever to remove the wood and cuttings. Because of this, the mortising chisel is made extra thick to prevent breaking.

Paring Chisel

The term paring means to make a fine cut or trim to a finish line. The paring chisel in figure 82C is a long chisel often used by pattern makers. It is used for slicing or paring cuts directly across wood grain and if used properly will result in smooth cuts. The paring chisel is driven only by hand and should be used to shave cuts in fitting projects together.

Firmer Chisel

A firmer chisel shown in figure 82D has a strong rectangular blade. It is designed for both heavy or light work and can be driven by hand or with a mallet.

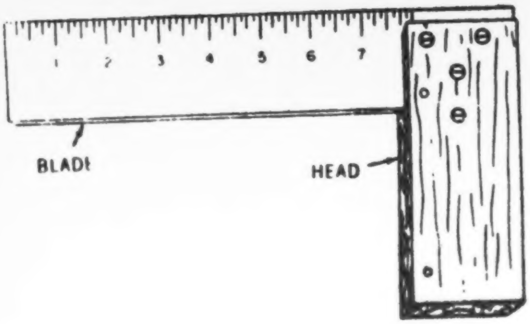


Figure 72. The Try Square

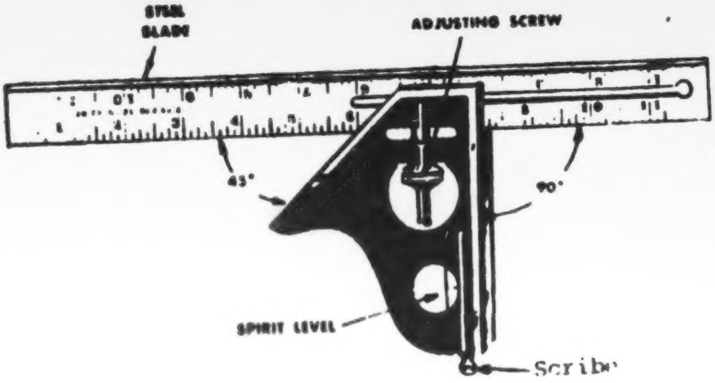


Figure 73. The Combination Square

Framing Chisel

The framing chisel shown in figure 82E is shaped like a firmer chisel, but has a very heavy, strong blade designed for rough carpentry work.

Slick Chisel

A slick chisel is shown in figure 83. These wide-blade chisels are used in heavy timber construction. Slick chisels are available in widths of 2 1/4 to 4 inches and with blade lengths from 8 to 12 inches. The slick chisel can be driven by hand, mallet, or light sledge hammer depending upon the size of the chisel. The slick chisels intended for use with mallets or small sledges will have a metal ring fitted on the end of its handle as shown on the top chisel in figure 83.

Flooring Chisel

A flooring chisel shown in figure 84 is an all-metal chisel designed for hard usage or where there is a possibility of encountering nails. It is similar to a brick set (chisel) used by masonry personnel with the only difference being the head on the end of the handle and the bevel ground on the end of the blade. A flooring chisel is designed to withstand rough usage and a great deal of hard pounding.

RASPS AND FILES

Both rasps and files are used for shaping or smoothing of wood surfaces. Rasps are coarse and used for rough work. Wood files are used to smooth or finish a project. Files are identified by the file's shape, length, and coarseness of the teeth, referred to as "cut". Some of the typical file shapes that you will encounter are shown in figure 85.

Files are made with two different shapes of teeth; single cut and double cut. A single-cut file's teeth will have a series of lines, evenly spaced, running diagonally across the face of the file. A double-cut file has diagonal lines crossing each other from opposite sides of the file's face. The lines on a single-cut file form a series of miniature chisel-like edges, where the double-cut files will have points that are formed because of the lines from opposite sides of the file's face intersecting. The common cuts of file teeth shown in figure 86 are

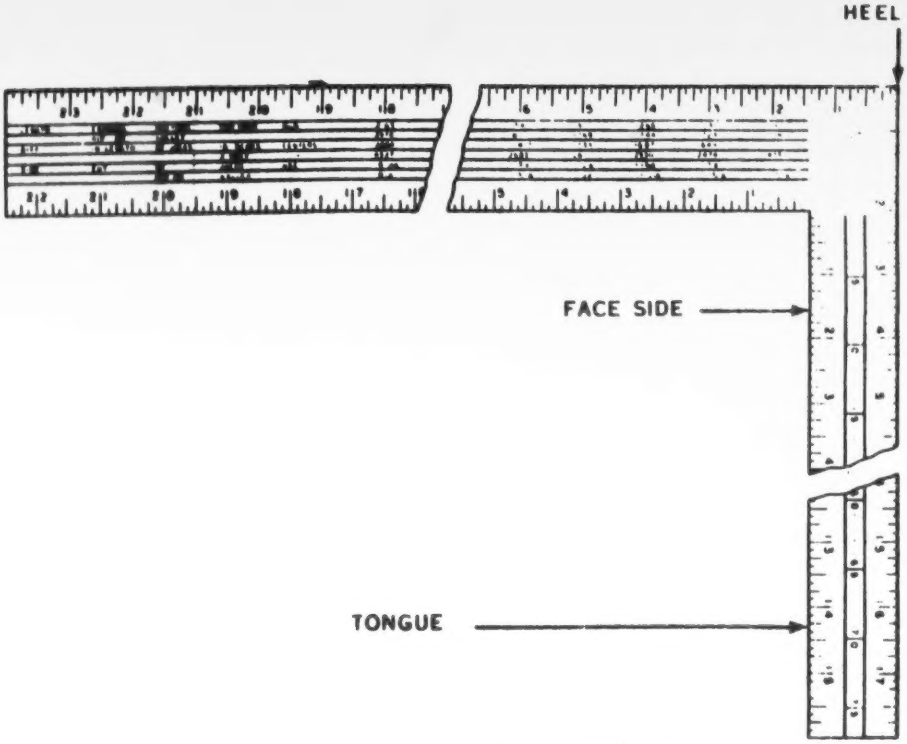

HEEL
FACE SIDE
TONGUE

Figure 83 Typical Framming Square

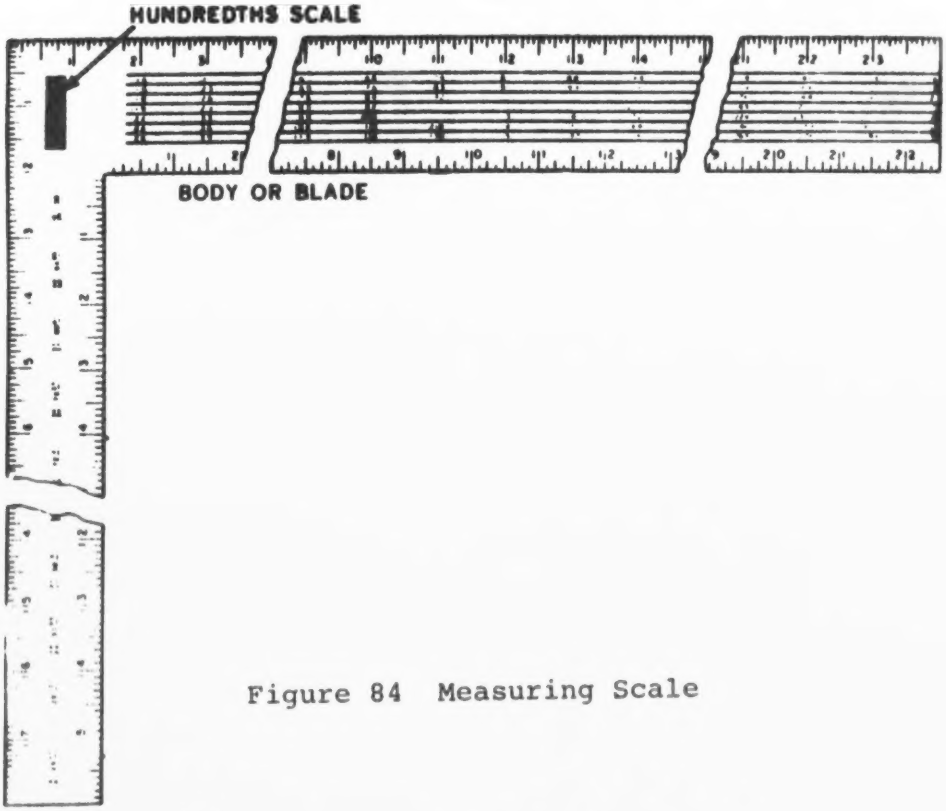

HUNDREDTHS SCALE
BODY OR BLADE

Figure 84 Measuring Scale

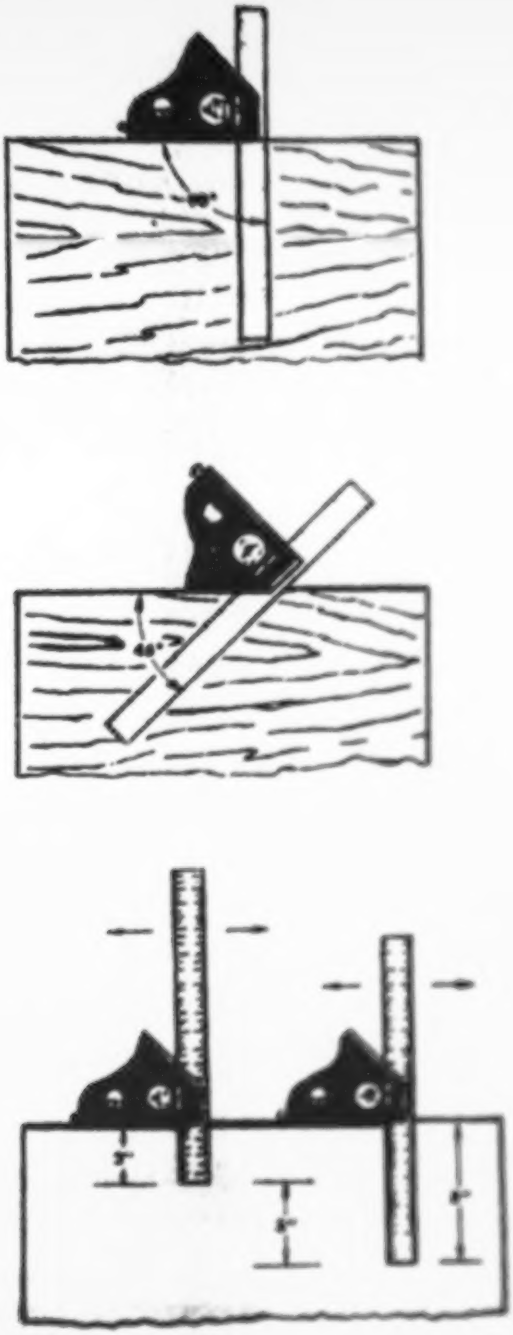


Figure 74. Using The Combination Square

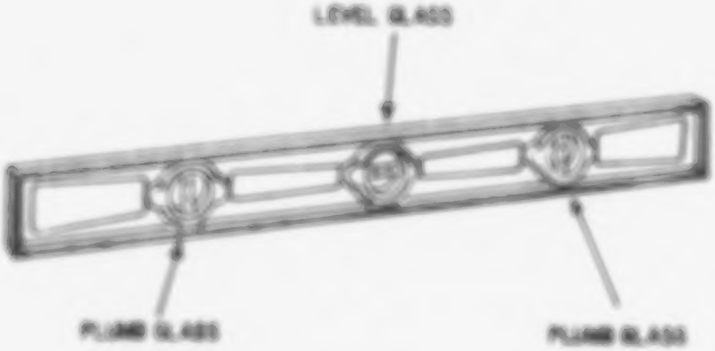

LEVEL GLASS
PLUMB GLASS
PLUMB GLASS

Figure 75. Carpenter's Level

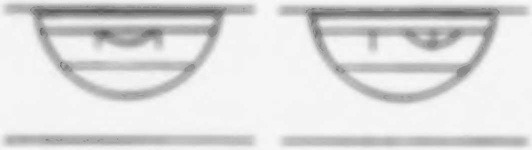


Figure 76. Note Position of Bubble When Checking Levelness

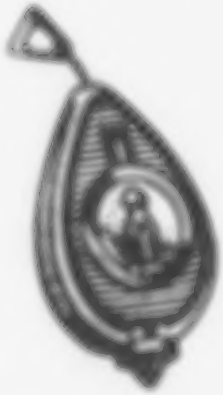


Figure 77. The Chalkline

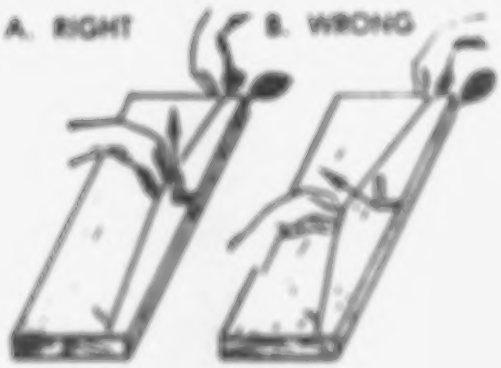

A. RIGHT
B. WRONG

Figure 78. Snapping the Line

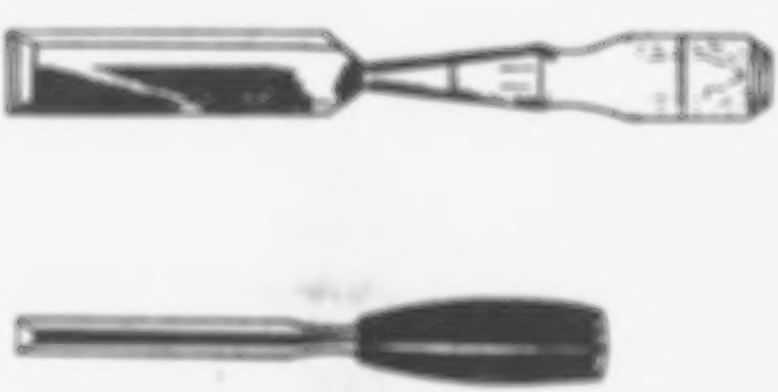


Figure 79. Types of Chisels

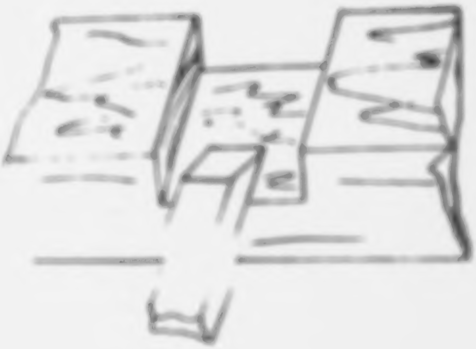


Figure 80. Finishing a Joint With a Chisel

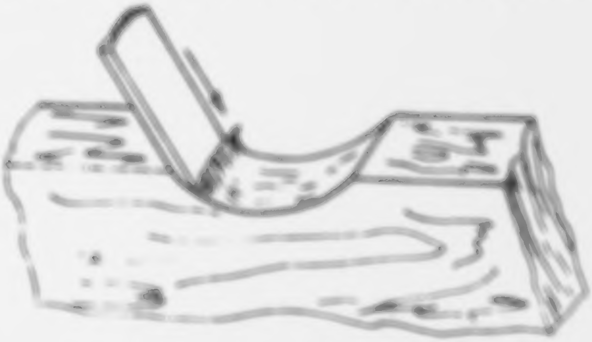


Figure 81. Making Concave Cuts

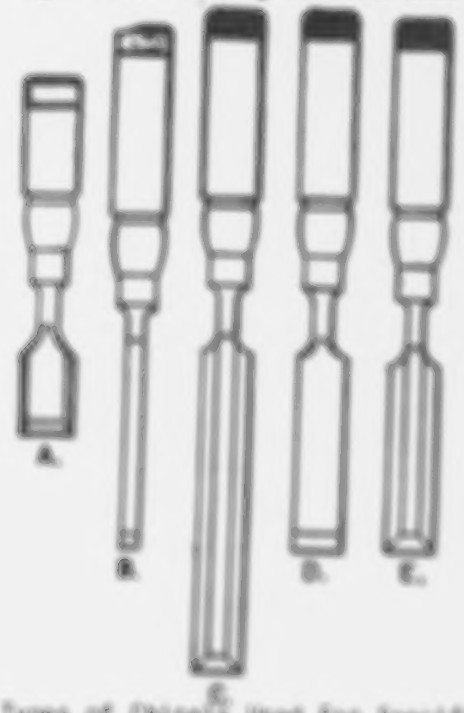


Figure 82. Types of Chisels Used for Specific Purposes

NOTE: A file handle shown in figure 88 is placed on the "tang" sharp end of the file or rasp before using, unless the tool is manufactured with rounded ends. The filing or rasping begins by applying pressure to the file or rasp with your hands as you push forward. If you are filing hard metal, do not pull back on the file. You should apply pressure only on the forward stroke of the file. Draw filing is done similar to straight filing, except that the file or rasp is held at an angle to a surface being filed. The file or rasp is moved back and forth over the length of your work and produces a finer finish that would be obtained by straight filing. If a file should become clogged, due to soft metal filing the teeth with wood or resin on a rasp, it should be cleaned with a file card or brush as shown in figure 89. The file card will remove hard-packed chips and pieces of metal that clog the teeth of the file or rasp.

VISES AND CLAMPS

Select tools used to support and hold woodworking materials. Tools used by a carpenter in a shop area to hold or support materials consists basically of vises and clamps. Vises may be bolted on or can be clamped to work benches. Clamps, usually are smaller and lighter in weight than a vise. Clamps may consist of 1 inch wide, large-diameter rubber bands, used to hold furniture together when gluing, or wooden handscrew clamps, pipe clamps, and bar clamps. Clamps usually are used for assembling a project, and vises are used for holding rough work such as cutting or shaping materials needed for a project.

Bench Vise

Most bench vises used in Air Force Carpenter shops are bolted to the top of tables or work benches. The base of a bench vise may be either of the swivel or rigid type. Both of these types of vises perform the same holding function, but the swivel-bench vise may be rotated to almost any desired position. This feature comes in real handy when sharpening long, metal cutting blades for machinery or cutting and shaping materials. A swivel-lock lever which allows you to turn a bench vise is located toward the bottom of the rear, stationary jaw of the bench vise (as shown in fig 90). Always make sure that this lever is tight before using a swivel type bench vise.

Woodworking Vise

A woodworking vise shown in figure 91 is bolted at the edge of a work bench or table with the top edges of the vise flush with the top of the bench. A woodworker's vise can be mounted on either end of a work bench. By placing the vise on the ends of a bench and since it is mounted under the bench, the vise is out of the way, in case you need the top of your work bench for larye projects. The inside jaws of a woodworking vise can be lined with wood to protect work being held in the vise. Some woodworking vises also have a half-thread on the threaded screw which allows you to slide the jaw against the work without a lot of turning. The vise can then be tightened by making a half-turn of the handle on the vise.

A woodworking vise should always be mounted to a workbench with heavy lag screws or bolts which are tightened with a wrench. This type of vise is used mostly for holding pieces of material together when gluing. Materials should remain in the wodworking vise until the glue has set.

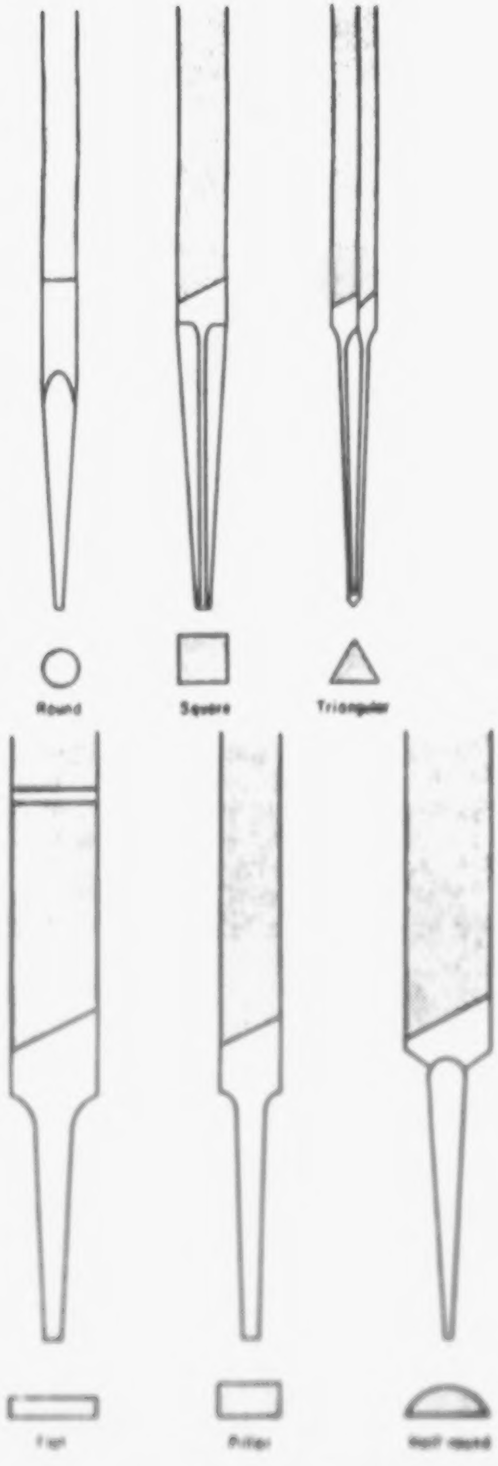

Round
Square
Triangular
Flat
Pillar
Half round

Figure 85. Typical File Shapes

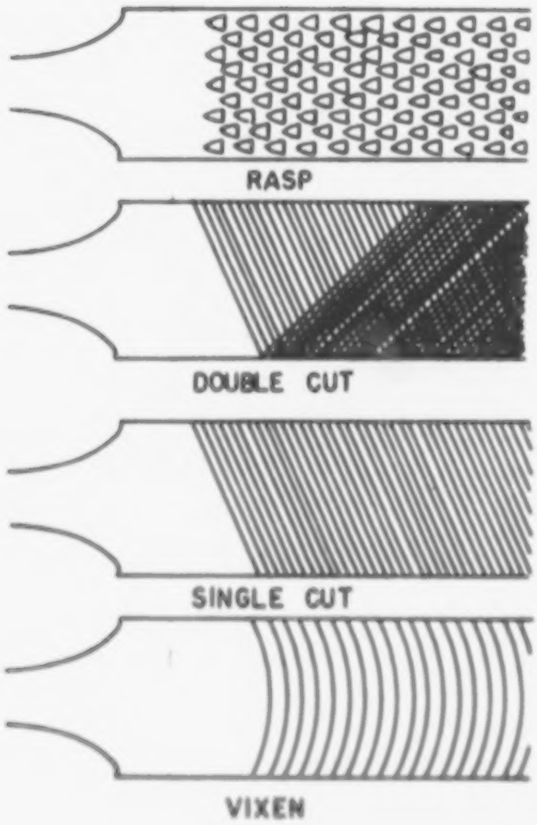

RASP
DOUBLE CUT
SINGLE CUT
VIXEN

Figure 86. Common Cuts of Files

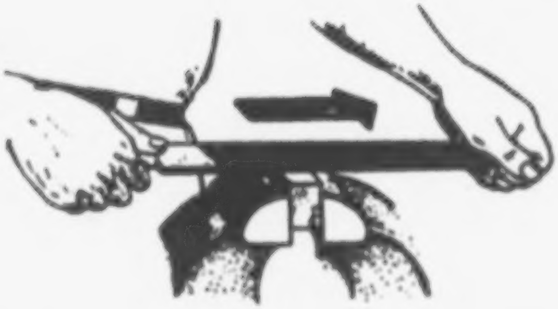


Figure 87. Straight Filing

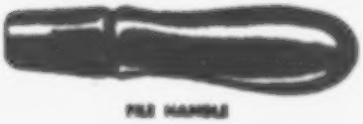

FILE HANDLE

Figure 88. A File Handle

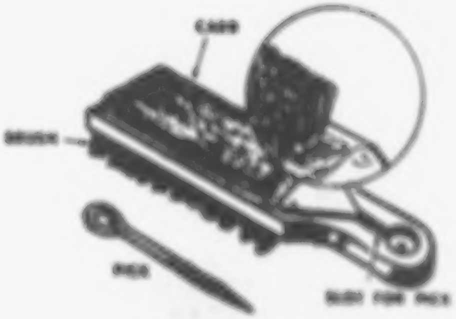

CARD
BRUSH
PICK
SLOT FOR PICK

Figure 89. Parts of a File Card

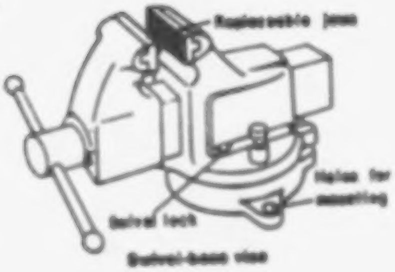

Replaceable jaws
Holes for mounting
Swivel lock
Swivel-base vise

Figure 90. Swive-Base Vise

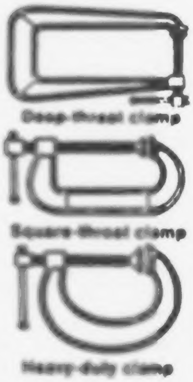

Deep-throat clamp
Square-throat clamp
Heavy-duty clamp

Figure 92. C-Clamps

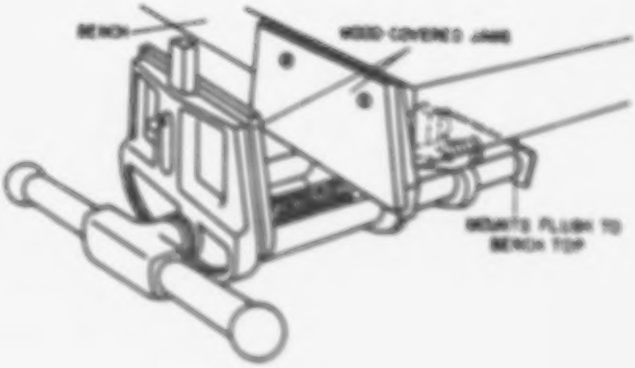

BENCH
WOOD-COVERED JAWS
MOUNTS FLUSH TO BENCH TOP

Figure 91. Woodworker's Vise

C-Clamps

The C-Clamps shown in figure 92 are used to hold material that is being sawed, glued, or planed. The size of a C-Clamp is determined by its maximum opening and ranges from 1 to 12 inches in size. Depth of a C-clamp will usually range from 1 to 4 inches, depending upon the size of the clamp, but some types of special deep-throated clamps are now available, offering a wide variety of depths.

When using C-clamps, you must protect the surface of a project on which you are working against marring by the jaws. This can easily be done by inserting a piece of scrap material on each side of your project before final tightening of the clamp. Use of scrap pieces of material serves another purpose when used with C-clamp and this is when the clamp is tightened, pressure is spread evenly over a wide area.

Hand-screw Clamps

Hand-screw clamps shown in figure 93 are woodworking clamps usually made of maple. The size of a hand-screw clamp is determined by the length of the jaw which ranges from 4 to 24 inches. Hand-screw clamps can be opened to hold materials from 3 to 10 inches thick, depending upon the size of the clamp. To use a hand-screw clamp, hold the spindles with your hands and rotate the clamp in the required direction to open to close the jaws evenly to the approximate size opening that you need. The clamp is then placed into position and you can make the final adjustments to tighten the clamp. Hand-screw clamps do not need pieces of scrap to protect material. If you refer to figure 93, you will notice that the hand-screw clamp can be used to glue material together cut on any type angles.

Bar/Pipe-bar Clamp

Bar clamps and pipe-bar clamps shown in figure 94 are often referred to as cabinet or furniture clamps. These clamps are constructed in two different ways. A bar clamp consists of a set of jaws mounted on a flat, steel bar that is from 12 to 48 inches in length. The pipe-bar clamp has jaws mounted on 1/2- and 3/4-inch diameter black steel pipes. One end of a pipe-bar clamp must be threaded to hold the "fixed" jaw assembly of a pipe-bar clamp, and the remainder of the pipe-bar clamp can be cut to the length that is desired. To use either of these clamps, you should set your project material against the fixed jaw of the clamp and then slide the movable jaws against the other side of your project.

NOTE: Before setting up the clamps, you should return the swivel-head assembly on the fixed jaw to the rear of the fixed-head assembly. This will allow you to put more pressure on your project when you begin tightening the clamps.

Select tools required to fasten materials or perform minor maintenance on carpentry equipment. Screwdrivers, pliers, and wrenches will often be used by a carpenter for a wide variety of jobs ranging from installing hinges on a door to the complete overhaul of a table saw. Normally, you will perform only minor maintenance to hand tools and equipment. As you progress in knowlege and are able to perform more complex skills, you will need a broader knowledge of tools than you will need form maintenance purposes.

SCREWDRIVERS

The parts which make up a screwdriver are shown in figure 95. Common screwdrivers are available with shanks ranging from 1 1/4 to 12 inches in length. The most commonly used screwdriver will have a shank size of 6 to 10 inches. The blades of a common screwdriver must match the size and type of screw being driven. The blade tip must fit snugly into the slot of a screw head and must not be wider than the screw head. It is also important that the blade tip be wide enough to reach across the slot opening in the screw as shown in figure 96. Oversize screwdrivers that are too wide, damage the heads of screws being driven.

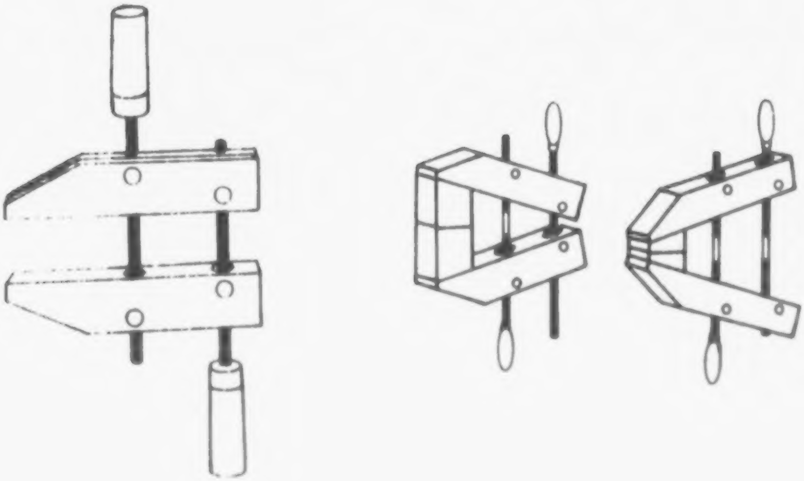


Figure 93. Hand-Screw Clamp

As a carpenter, you are going to be issued a different assortment of screwdrivers such as the types shown in figure 97. You probably will not be issued all of these screwdrivers but you will encounter them during your service career. You should always carry three sizes of common screwdrivers to take care of any type of work requiring different screws to be driven. A large- medium-, and small shank common screwdriver will help you take care of nearly any work that you encounter. Some of the screwdrivers that you will be issued will have magnetic-blade tips or a screw-holding tip. Magnetic tip screwdrivers can be used when driving steel screws and are especially useful if the screws are small in size. Screwdrivers with a screw-holding tip can be used to drive any type screw such as screws made of brass, copper or steel. Though these two different types of screwdriver tips many seem unimportant now, the first time you encounter difficulty driving screws, or suffer an injury to your fingers trying to hold and drive a small screw, then these tools will become very important to you.

Phillips Screwdrivers

The Phillips screwdriver shown in figure 95 is used for fastening screws that have a Phillips head. They are similar to a common screwdriver in design, except that the blade tip is shaped like a cross. A Phillips screwdriver is often referred to as a cross-point screwdriver.

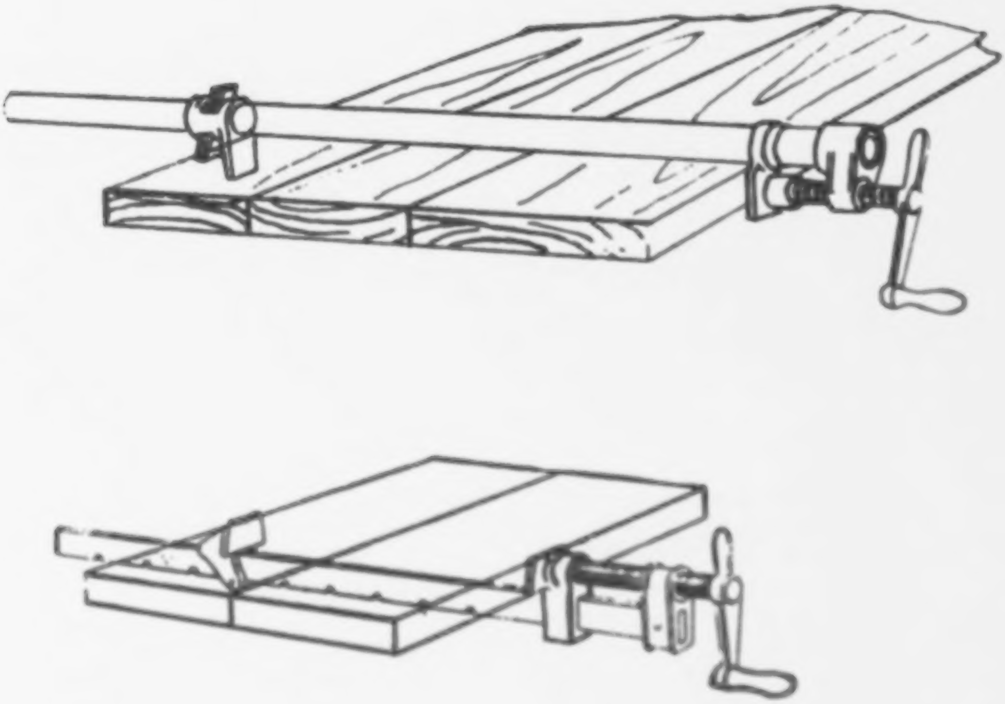


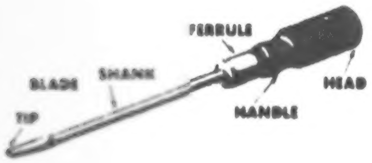
Figure 94. Bar/Pipe-Bar Clamps

Off-set Screwdrivers

Off-set screwdrivers also shown in figure 97 are designed to turn screws in awkward positions. There are two types of off-set screwdrivers; a solid and a ratchet type. Both are used to turn common or phillips wood screws.

Spiral-Ratchel Screwdrivers

A spiral-ratchet screwdriver is the most useful of screwdrivers when you have a large number of woodscrews to fasten. This type of screwdriver is available with interchangeable bits for common or phillips-type wood screws. You can effectively use a spiral-ratchet screwdriver by holding the chuck sleeve, which contains the bit, with your free hand and pushing on the head of the handle with your other hand. You can change the turning direction or secure the blade in one position by pressing and moving the lock key located on the shank of the screwdriver. If the lock key is placed in the center of the opening, the turning mechanism is locked into place and the screwdriver can be used to tighten or remove wood screws.



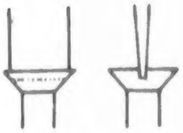


Figure 95. Parts of a Screwdriver

Figure 96. Using the Correct Size of Screwdrivers

NOTE: When using a spiral-ratchel screwdriver you must use it carefully because of the powerful spring inside the handle. When you shut and lock the screwdriver, it applies a large amount of extension to the spring. If you accidentally press the lock key located in the shank, the shank will shoot out with great speed and pressure. If the blade isn't secured in the chuck sleeve, it can shoot even farther causing injury to yourself or coworkers.

WRENCHES

As a carpenter, most likely you will not be issued many of the wrenches shown in figure 98, however, there are many types of wrenches which come with the portable power tools that we are going to cover in the next chapter. Most shops will have wrenches used to perform minor maintenance on the equipment in your duty section. Each wrench is unique in design and must be used for the purpose it was designed.

Adjustable Wrenches

Adjustable wrenches as shown in figure 98, are available from 4 to 18 inches in length. This type of wrench can be used to tighten nuts and bolts from 1/2 to 2 /16 inches in size. The correct way to use an adjustable is shown in figure 99.

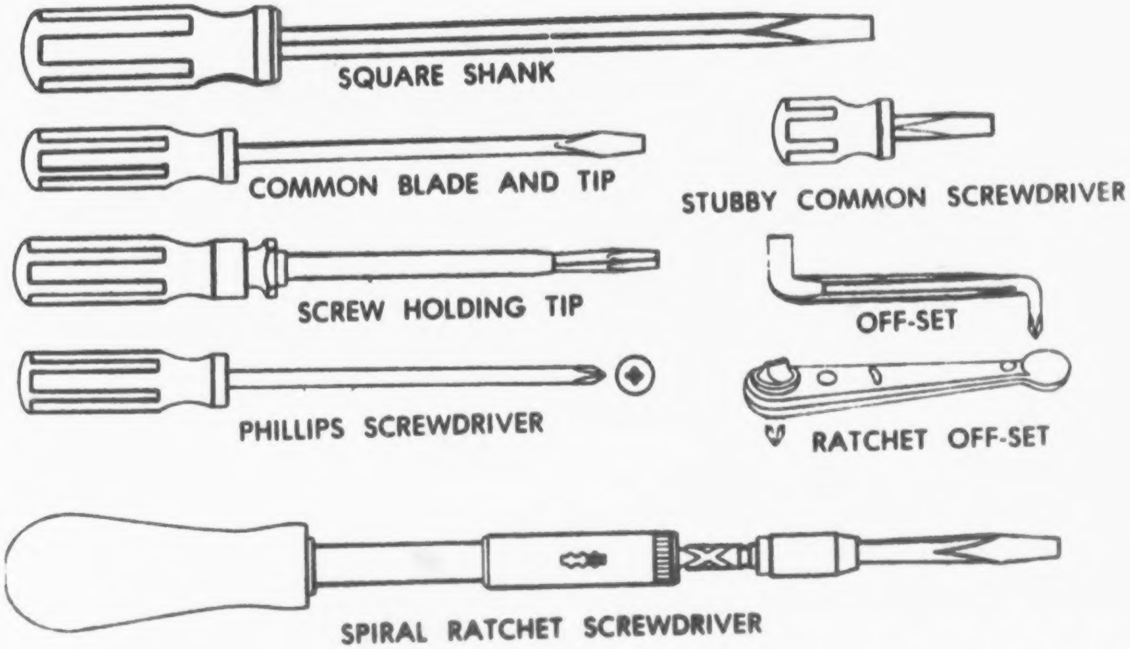

SQUARE SHANK
COMMON BLADE AND TIP
STUBBY COMMON SCREWDRIVER
SCREW HOLDING TIP
OFF-SET
PHILLIPS SCREWDRIVER
RATCHET OFF-SET
SPIRAL RATCHET SCREWDRIVER

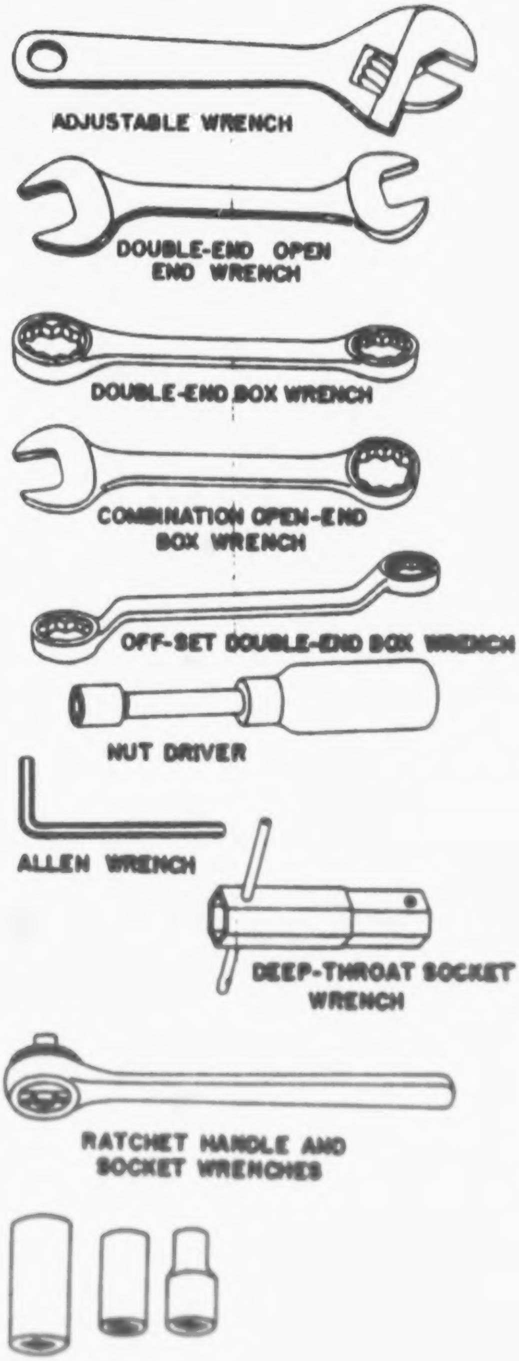
Figure 97. Assortment of Screwdrivers

Open-End Wrench

When using an open-end wrench, you must select the wrench so that it fits a nut or bolt head correctly. Always be sure that a nut or bolt head is fully seated in the jaw openings of the wrench before you attempt to tighten or loosen a nut or turn a bolt.

Box-End Wrench

A box-end wrench is made to completely enclose a nut or bolt head and if used correctly will not slip. These types of wrenches, as shown in figure 100, are designed to tighten nuts that are difficult to fasten with open-end wrenches or when working in close spaces.


ADJUSTABLE WRENCH
DOUBLE-END OPEN END WRENCH
DOUBLE-END BOX WRENCH
COMBINATION OPEN-END BOX WRENCH
OFF-SET DOUBLE-END BOX WRENCH
NUT DRIVER
ALLEN WRENCH
DEEP-THROAT SOCKET WRENCH
RATCHET HANDLE AND SOCKET WRENCHES

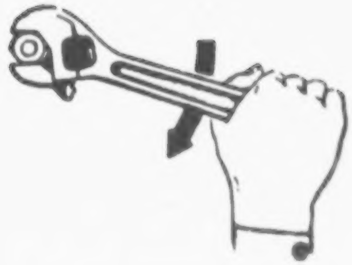


Figure 99. Proper Way to Use The Adjustable Jaw Wrench

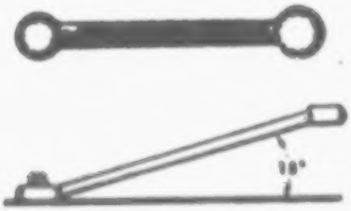


Figure 100. Using the Box-End Wrench

Figure 98. Assortment of Wrenches

Allen Wrenches

Allen wrenches shown in figure 98 are made of case-hardened steel and have six sides. It is designed for fastening Allen-type screws and set screws on equipment. Allen wrenches are sometimes referred to as hex-key wrenches.

Nut Drivers

Nut drivers shown in figure 98 are designed to fit hex (six-sided) nuts ranging in sizes from 3/16 to 1/2 inch. Some types of nut drivers have a straight shank on which you can fasten different sizes of socket wrenches. Nut drivers are used in the same manner as screwdrivers.

Ratchet Handle/Socket Wrenches

Ratchets come in a variety of sizes which is determined by the size of the square shank located on the bottom of the tool. The direction you wish a ratchet handle to turn is controlled by adjusting the stem located in the head part of the ratchet handle shown in figure 98. Socket wrenches come in sizes to fit the shank on the ratchet handle. The sizes of socket wrenches available to fit on a standard ratchet may range from 6 to more than 200 different types of fittings.

PLIERS, PINCHERS AND TIN SNIPS

These types of hand tools are designed for holding, cutting, or shaping materials by a carpenter when performing your assigned duties. There will be times when it will be impossible to carry a large number of tools out to a job site. These tools can perform the same function as a large number of wrenches, hack saws or even a metal-cutting machine.

Slip-Joint Pliers

Slip joint pliers shown in figure 101 are also referred to as combination or adjustable pliers. They are available in common lengths ranging from 6 to 10 inches. Slip-joint pliers have a two-position jaw pivot that allows a normal or wide jaw opening. Primarily, slip-joint pliers are used as a gripping or holding tool and used for bending wire. They can also be used to remove nails too small to remove with a claw-hammer.

Side Cutting Pliers

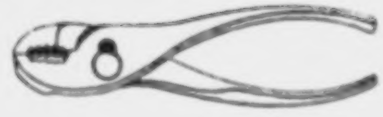
Also referred to as linemans pliers, these tools have side cutters with which you can cut small diameter nails or wire. Side cutting pliers are another type of holding tool which are made with a flat nose which allows a firm grip when removing small nails.

Carpenter's Pinchers

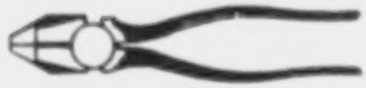
Also referred to as end-cutting nippers, a carpenter uses the pinchers for cutting wire or nails. They are most effective for cutting nails flush with a surface or if carefully used can be used to pull nails with stripped heads out of pieces of wood.

Tin-Snips

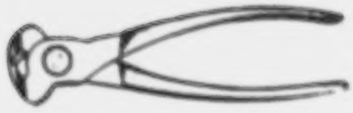
Tin snips are used by a carpenter for cutting sheet metals such as roof flashings or gutters. Tin-snips with a cut of 3 to 3 1/2 inches are most often used by carpenters.



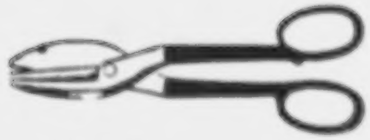
SLIP-JOINT PLIERS



SIDE CUTTING PLIERS



CARPENTERS PINCHERS



TIN SNIPS

Figure 101. Pliers, Pinchers And Tin Snips

CLEANING, TREATING, LUBRICATING, AND STORAGE OF TOOLS

The life of a tool, or an item of equipment used under ordinary conditions, can be indefinite. Craftsmen are proud of tools and equipment that they have had for a long time because the tools are still as accurate and serviceable as they were the day they were purchased. Let's see how proper cleaning, treating, lubricating, and storage of tools can make your work more enjoyable and help extend the useful life of your tools.

Cleaning

The old adage "Cleanliness is next to Godliness" is especially important for the carpenter's tools. When you use any tools or item of equipment, clean it immediately and lubricate it, or wipe it with an oily rag to prevent it from rusting.

Woodworking tools and equipment can be cleaned in a variety of ways. Use a brush (either a painter's duster or a bench brush) or a vacuum cleaner to clean machines and benches in the shop. An ordinary whiskbroom can be used to clean a drill press. DO NOT use compressed air to clean equipment because of the hazards created by the chips and dust which are thrown into the air. Another dangerous practice to avoid is to use your hands to clean a machine or bench; you can pick up splinters or metal filings which could injure your hands.

When a commercial aircraft engine has logged 2,000 hours, it is disassembled, cleaned, inspected, and reassembled. This maintenance provides an extended service life to the engine. The life of shop and portable power equipment would be extended greatly if this practice were followed in the shop. You should perform routine maintenance on equipment to clean it and to inspect the parts for defects. This procedure will give you longer and better service from your equipment.

Treating

After a machine or hand tool has been cleaned, wipe it off with a soft rag impregnated with SAE 10 motor oil or a lightweight machine oil. If the tool has wooden handles, wipe the handles with linseed oil to keep the wood from drying. This oil treatment will provide better service from the wooden handles than it will to paint them unless they are exposed to the weather. Now, let's look at the advantages of proper tool lubrication.

Lubricating

The purpose of lubricating tools and machines is to reduce the amount of friction resistance between two surfaces when one slides against the other. To accomplish this, a film of lubricant is forced into the space between the moving parts.

Many items of equipment manufactured today have sealed bearings and require no lubrication. If a machine has the type of bearings that require lubrication, refer to the service manual or technical publication for the proper type of lubricant and the proper lubrication procedures.

In addition to proper cleaning, treating, and lubricating procedures, it is important that you take care of your equipment when you are not using it to obtain satisfactory service. Let's see how to store equipment properly.

Storage

The way you store your tools is an indication of your ability to use tools and your appreciation for good, sharp tools. If each tool has a particular place or a special rack in which to store it, it is an indication of good care and an appreciation for good, sharp tools. There is a close correlation of proper tool care and good workmanship. You should abide by the old motto, "A place for everything and everything in its place."

If your shop and tool storage area doesn't have racks and tool holders, you can easily make them from wood or metal. Cheap hooks and holders can also be obtained at a reasonable price. A good method to encourage the replacement of a tool to its proper place is to silhouette the tool on the tool board. This can be done very easily with spray paint, stencils, and masking paper and tape.

If tools and equipment are kept clean and well lubricated, they will normally provide good service and will last a lifetime. However, occassionally, a tool or item of equipment does need minor repairs. Let's see how to make these minor repairs.

MINOR REPAIR OF TOOLS AND EQUIPMENT

A sharp tool is a pleasure to use. Likewise, it is a satisfying experience to use a tool or machine in good repair. New tools and equipment are normally in good repair, but after considerable use, they frequently require simple repairs and adjustments.

Simple repairs and adjustments include such jobs as replacing handles, replacing small parts such as bolts and screws, installing or adjusting belts, and replacing bearings.

Replacing Handles

Some organizations require that a tool with a broken handle be turned in and exchanged for a serviceable one. However, often a craftsman likes the feel of a particular tool, or he may want to install a handle to provide his own particular "feel." In any case, you need to know how to repair or replace broken handles.

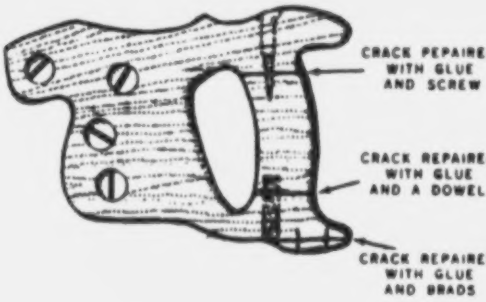

CRACK REPAIRED WITH GLUE AND SCREW
CRACK REPAIRED WITH GLUE AND A DOWEL
CRACK REPAIRED WITH GLUE AND BRADS

Figure 102. Handsaw Handle Repairs

Keep several replacement hammer, hand ax, plane, file, and saw handles on hand so that the replacement can be accomplished without too much lost time. First, let's examine how easy it is to repair or replace handles.

Repair a handsaw handle with glue and dowels, brads, or screws, as shown in figure 102. You can repair the handles and knob of a hand plane in a similar manner if a replacement cannot be obtained.

You can make a file or rasp handle, such as the one in figure 103, if you do not have a commercial one available. Turn the handle on the lathe and press the ferrule on the handle. Drill the hole in one end and make it rectangular by forcing the tang of the file or rasp into it. This assures a tight fitting handle.

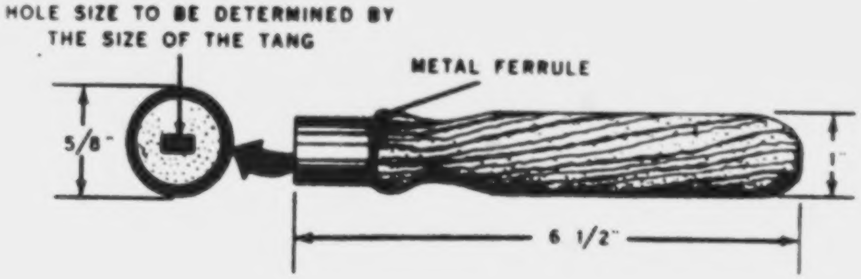


Figure 103. File Handle

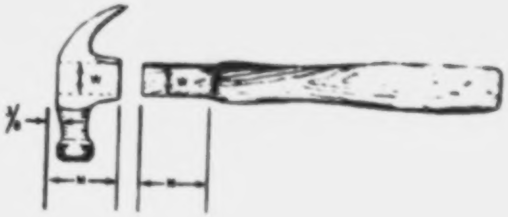


Figure 104. Preparation of the Hammer Handle

Replace a hammer handle by tapering the handle slightly smaller than the eye of the hammer head, as shown in figure 104. This is done with a drawknife or a wood rasp. Saw a kerf in the end of the handle about 1 1/2 inches deep, as shown in figure 105. This kerf should extend about three-fourths the distance through the eye of the hammer. Drive the handle through the eye with a ball peen hammer or wooden mallet, as shown in figure 106, until the handle extends abut 3/8 inch.

After the handle is in the eye, cut the extended part with a hacksaw and drive a hardwood wedge into the saw kerf to spread the handle. Next, use two metal wedges to safety the hardwood wedge, as shown in figure 107. Sand all rough edges and wipe the handle with a rag soaked with linseed oil.

The handles of wood chisels are similar to file handles. There are, however, two types of wood chisels, and each requires a different type of handle. Figure 108 shows the two types of handles and how to make them. If a wood handle becomes mushroomed, cut it off and install a ferrule or leather washers, as shown in figure 109.

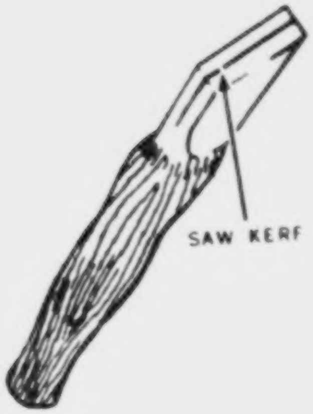


Figure 105. Saw Kerf

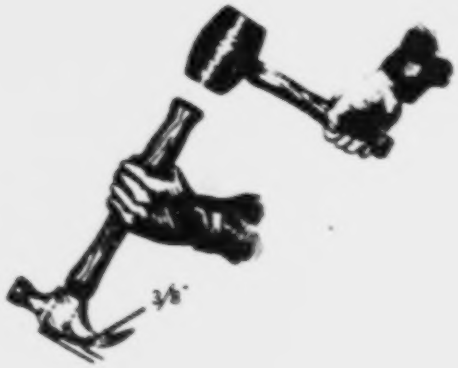


Figure 106. Installing the Handle

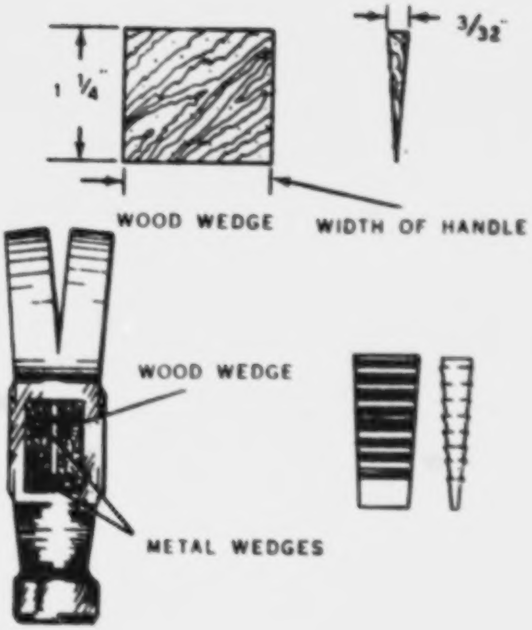

1 1/4"
3/32"
WOOD WEDGE
WIDTH OF HANDLE
WOOD WEDGE
METAL WEDGES

Figure 107. Installing the Wedges

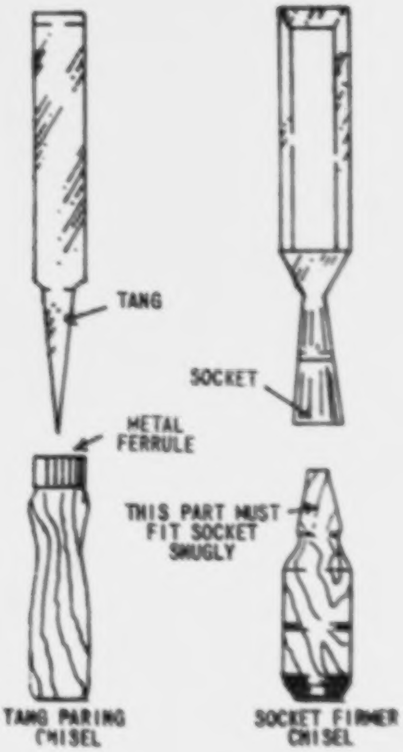

TANG
SOCKET
METAL FERRULE
THIS PART MUST FIT SOCKET SNUGLY
TANG PARING CHISEL
SOCKET FIRMER CHISEL

Figure 108. Wood Chisel Handles

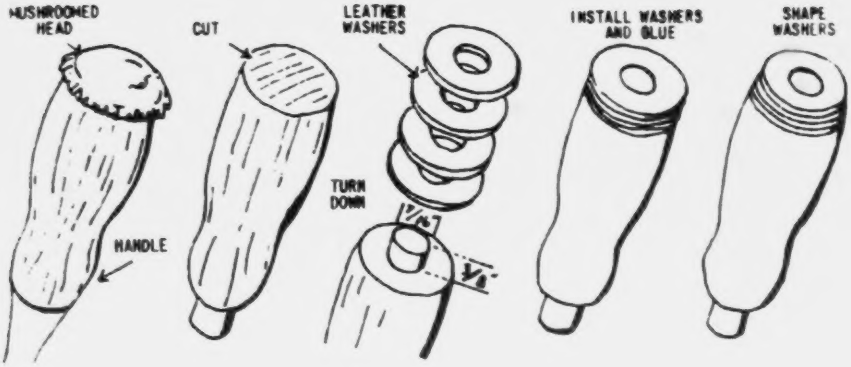


Figure 109. Repairing a Mushroomed Chisel Handle

Replacing Small Parts

Your carpentry handtools, portable power tools, and shop equipment will ordinarily give you long and trouble-free service, but occasionally they require replacement of broken parts or parts that have become loose. Loose parts may, consequently, become lost. When a part becomes defective, refer to the technical order or a commercial publication and order a replacement part. It is usually a simple matter to replace parts. It is normally a poor practice to use substitute parts. Instead, use parts manufactured for your equipment.

TOOL SHARPENING

A sharp tool makes woodworking a pleasure. A dull tool slows down the work and often gives inaccurate results. In addition, dull tools require more effort to use than sharp tools. While it seems to take much time to sharpen a tool, especially when you are anxious to work with it, much time is really saved through efficiency when you work with a sharp tool.

Normally, edged tools can be kept sharp by an occasional whetting. Sometimes, touchup with a file is necessary before whetting to obtain a sharp edge. Grinding is necessary when edges or bevels get nicked or badly worn through neglect or prolonged use.

Let's explore how to sharpen and maintain a keen edge on various hand tools and power tools.

Hand Tools

Although you will use power equipment to perform most of your work, hand tools are still a "must" for the carpenter. Often, jobs must be accomplished where there is no power; also, some jobs can be done better by using hand tools than by using power equipment. Let's review the proper techniques of sharpening auger bits, wood chisels, plane irons, handsaws, drills, screwdrivers, and half-hatchets.

Auger Bits. To sharpen an auger bit, select an auger bit file, as shown in figure 110, or a small slim taper, triangular file. When you file an auger bit, place the bit against the bench top or a piece of wood held in a vise.

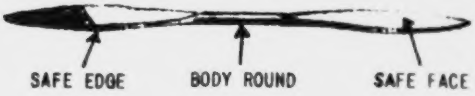


Figure 110. Auger Bit File

To sharpen the cutting lip of the bit, file only the top surface of the cutting lip, as shown in figure 111. Follow the original bevel established by the manufacturer.

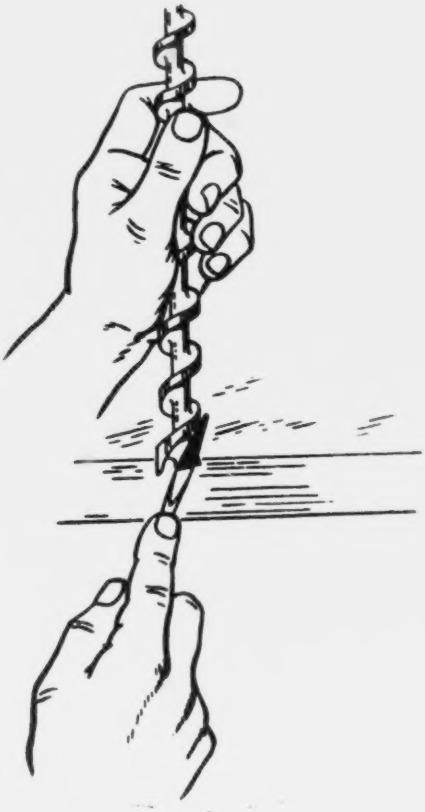


Figure 111. Sharpening the Cutting Lip

To sharpen the spurs, file only on the inside, as shown in figure 12. If you file on the outside, it will reduce the diameter and you will not be able to turn the bit.

Examine the feed screw, and if any of the threads are bent or damaged, straighten them with the auger bit file.

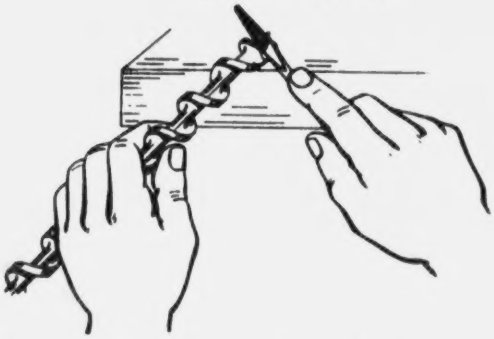


Figure 112. Sharpening the Spur

Wood Chisels

To sharpen a wood chisel, inspect it carefully for nicks. If it is nicked, use the grinder to obtain the proper shape and bevel of the chisel, as shown in figure 113.

Remember when you sharpen a wood chisel on a grinder, remove it from the wheel frequently and dip it in water to prevent it from overheating. If it overheats, it will lose its temper and the chisel will not hold an edge.

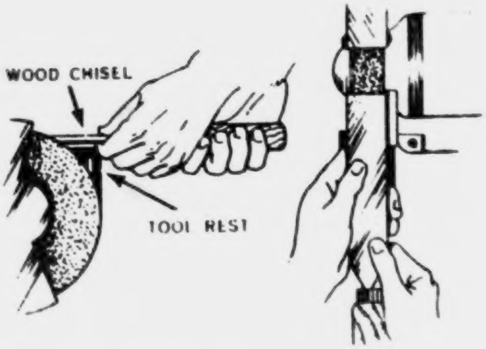

WOOD CHISEL
TOOL REST

Figure 113. Sharpening the Wood Chisel on a Grinder

To sharpen or whet a wood chisel on an oilstone, select an oilstone that has coarse grit on one side and fine grit on the other. Cover the stone with a light machine oil so that the fine particles of steel ground off will float and thus prevent the stone from clogging.

Hold the chisel in one hand, with the bevel flat against the coarse side of the stone. Use the fingers of your other hand to steady the chisel and hold it down against the stone. Using smooth even strokes, rub the chisel back and forth parallel to the surface of the stone, as shown in figure 114. The entire surface of the stone should be used to avoid wearing a hollow in the center of the stone. Do not rock the blade. The angle of the blade with the stone must remain constant during the whetting process.

After a few strokes, a burr, wire edge, or feather edge is produced. To remove the burr, first take a few strokes with the flat side of the chisel held flat on the fine grit side of the stone. Be careful not to raise the chisel even slightly, since it will put a bevel on the flat side. If this happens, the chisel must be ground until the bevel is removed.

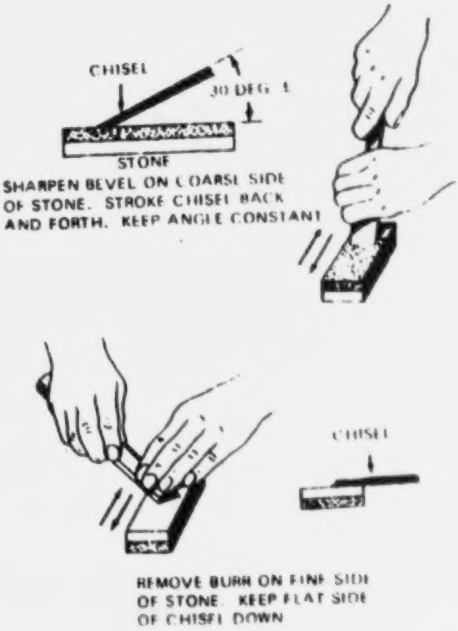

CHISEL
30 DEG
STONE
SHARPEN BEVEL ON COARSE SIDE OF STONE. STROKE CHISEL BACK AND FORTH. KEEP ANGLE CONSTANT
CHISEL
REMOVE BURR ON FINE SIDE OF STONE. KEEP FLAT SIDE OF CHISEL DOWN

Figure 114. Sharpening the Wood Chisel on an Oilstone

After whetting the flat side on the fine grit side of the stone, turn the chisel over and place the bevel side down and hold it at the same angle as used when whetting on the coarse side of the stone. Take two or three light strokes to remove the burr.

To test the sharpness of the cutting edge, hold the chisel where a good light will shine on the cutting edge. A keen edge does not reflect light in any position. If there are no shiny or white spots, it is a good, sharp edge.

Plan Irons

Sharpen the plane iron by following the same procedures as for sharpening the wood chisel. The bevel on the plane iron should be about 25°.

Handsaws

There are two types of handsaws: the crosscut and the rip. The crosscut saw is used to cut wood across the grain and the ripsaw is used to cut wood with the grain.

You do not have to be an expert to reset and sharpen a handsaw. The main thing to remember is DO NOT wait until your saw is in poor condition to reset and sharpen it.

The first thing to do before sharpening any handsaw is to joint it. This means to level the tips of the teeth, and then reshape them so that they are the same depth. This step can be eliminated if you do not let your saw get in poor condition.

However, if your saw has teeth of various lengths, run a mill file lightly along the points of the saw teeth. Do this until all teeth points have been touched with the file.

The next step is to set the teeth by using a sawset, as shown in figure 115. Adjust the sawset for the tooth size by turning the adjusting nut on the front of the sawset. Start setting the saw from the toe (small end) of the blade, bending the top half of every other tooth to a distance of about half the thickness of the saw blade. Reverse the ends of the saw to set the teeth on the opposite side.

The next step is the actual sharpening process. The crosscut saw is sharpened in a different manner from the ripsaw. Let's first go through the procedures of sharpening a crosscut saw.

First, select a slim taper, triangular file that is the correct size for the saw teeth of the saw you are sharpening.

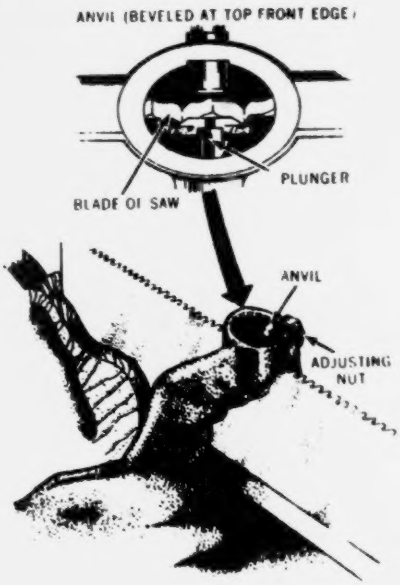


Figure 115. Setting the Teeth of a Handsaw

Next, fasten the crosscut saw in a saw clamp or vise. Start filing the right side of the first tooth nearest the toe of the saw. Hold the file as shown in figure 116. Be sure you hold it at the three angles shown in figure 117. File every other tooth to the right of the teeth that lean toward you.

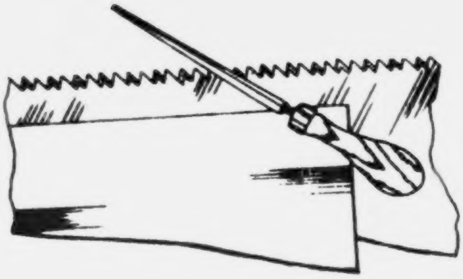


Figure 116. Filing the Crosscut Saw

Next, reverse the saw in the clamp and file the opposite teeth by holding the file at the same angles shown in figure 117, except for the 10° to 15° angle to the horizontal, which must be reversed. Continue filing until the flat teeth come to a point. This assures you that each tooth will be exactly the same length.

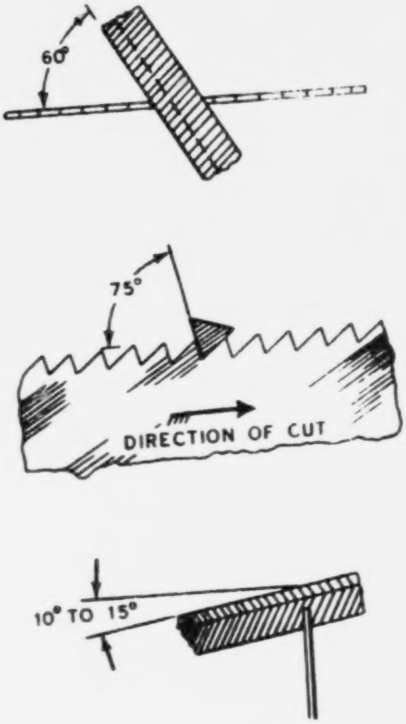


Figure 117. Filing Angles for Crosscut Saw

To sharpen a ripsaw, joint and set the teeth as you did for the crosscut saw; then fasten it in the vise. Start at the toe and file every other tooth almost straight across and almost vertical, as shown in figure 118.

Push the file almost straight across, applying a little more pressure on the long slant than on the face of the tooth next to it. Be careful that you do not apply too much pressure on the face of the tooth, because it will result in excessive negative rake and the saw will not cut satisfactorily. Continue filing every other tooth until you reach the handle; then reverse the saw in the clamp or vise and repeat the procedure. Another item of equipment that is important for the woodworker to keep sharp is the twist drill bit. Let's see how to sharpen the twist drill bit.

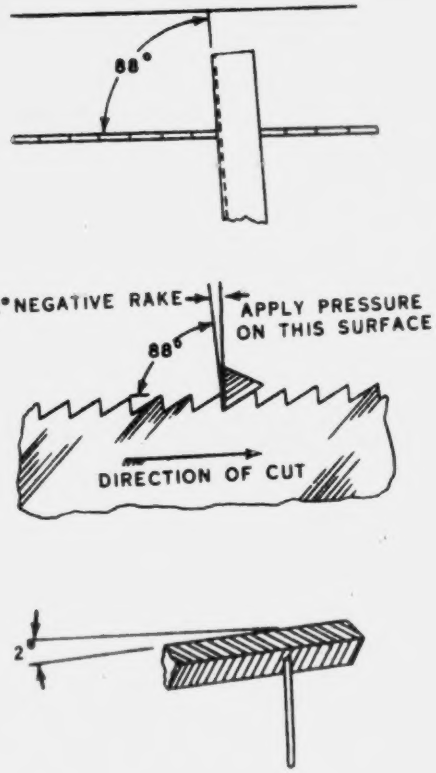


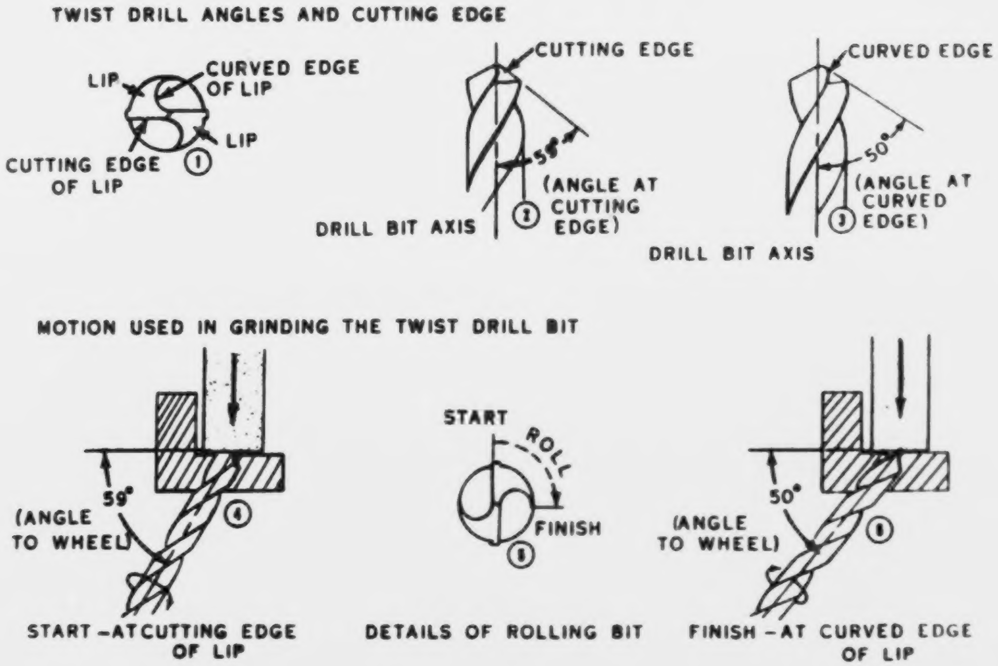
Figure 118. Filing Angles for Ripsaw

Twist Drill Bit

To sharpen the twist drill bit, examine the tip surface to identify the cutting edge and the curved edge, as shown in item 1 of figure 119. The cutting lip of the cutting edge should be sharpened at a 59° angle and the curved edge at approximately a 50° angle to the drill bit axis, as shown in item 3 of figure 119. This taper will prevent binding.

To sharpen the twist drill bit, place the bit on the grinder tool rest at a 59° angle while the wheel is turning. Lines drawing on the tool rest will help align the bit. Rotate the bit clockwise in your fingers so that the contour of the lip rolls on the turning wheel from the cutting edge toward the curved edge, as shown in items 4, 5, and 6 of figure 119.

While rotating the bit, gradually lower the shank end of the bit so that at the finish of the cut, the shank end of the bit is lower than at the start. This action will grind the curved edge of the bit to approximately a 50° angle. Let's now look into the matter of sharpening a tool that is often overlooked during sharpening processes--the screwdriver.


TWIST DRILL ANGLES AND CUTTING EDGE

MOTION USED IN GRINDING THE TWIST DRILL BIT

LIP
CURVED EDGE OF LIP
LIP
CUTTING EDGE OF LIP
①
CUTTING EDGE
59°
(ANGLE AT CUTTING EDGE)
DRILL BIT AXIS
②
CURVED EDGE
50°
(ANGLE AT CURVED EDGE)
③
DRILL BIT AXIS
59°
(ANGLE TO WHEEL)
④
START-AT CUTTING EDGE OF LIP
START
ROLL
FINISH
⑤
DETAILS OF ROLLING BIT
50°
(ANGLE TO WHEEL)
⑥
FINISH-AT CURVED EDGE OF LIP

Figure 119. Sharpening the Twist Drill Bit

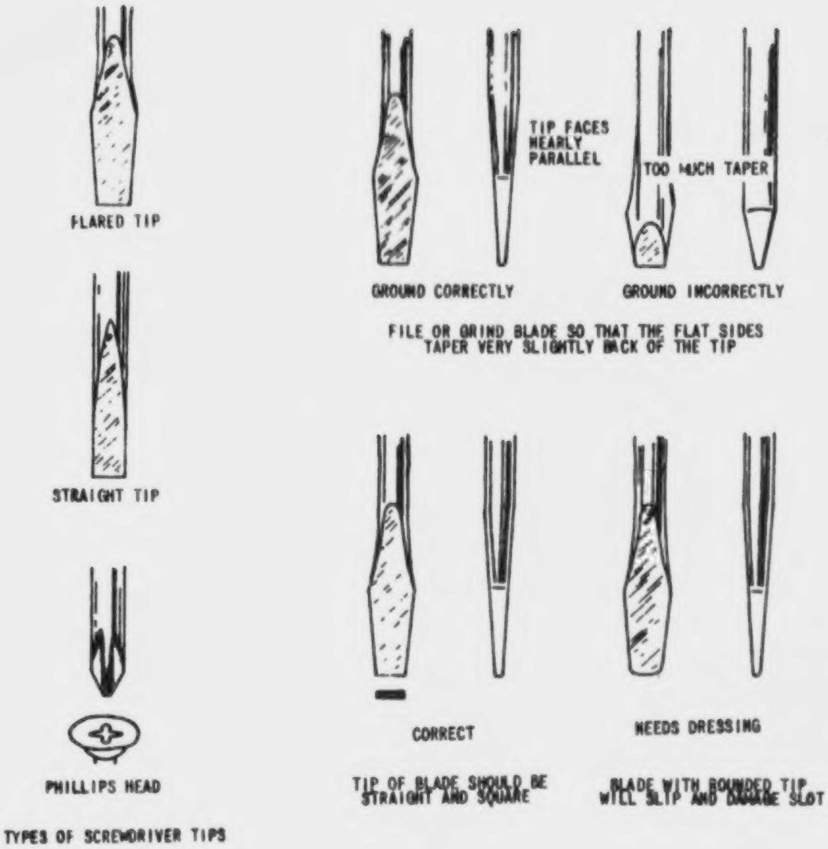

FLARED TIP
STRAIGHT TIP
PHILLIPS HEAD
TYPES OF SCREWDRIVER TIPS
TIP FACES NEARLY PARALLEL
TOO MUCH TAPER
GROUND CORRECTLY
GROUND INCORRECTLY
FILE OR GRIND BLADE SO THAT THE FLAT SIDES TAPER VERY SLIGHTLY BACK OF THE TIP
CORRECT
NEEDS DRESSING
TIP OF BLADE SHOULD BE STRAIGHT AND SQUARE
BLADE WITH ROUNDED TIP WILL SLIP AND DAMAGE SLOT

Figure 120. Shapes of Screwdriver Blades and Tips

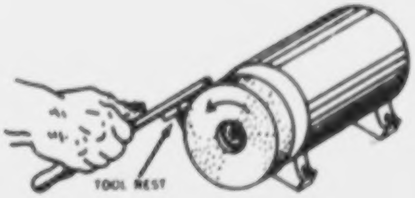
Screwdrivers

There are two main types of screwdriver blades: the Phillips and the straight or flared tip. The Phillips screwdriver normally requires special holding fixtures to sharpen it, so it is not recommended that this tool be sharpened by grinding. Sometimes, it can be touched up with a fine file.

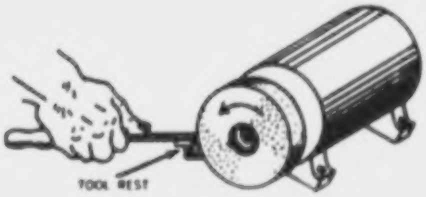
The straight or flared tip screwdriver should first be reground on an emery wheel to its original shape, as shown in figure 120. The tip faces should be almost parallel to keep the tool from lifting out of the screw slot when in use. The end of the tip should be square, at a right angle to the face, and the sides should be alike in shape and angle.

To sharpen the screwdriver, you first thin the tip slightly by holding each face to the wheel, as shown in 1 of figure 121. This will give it a slight hollow ground effect. Now, hold the working edge (tip) squarely on the wheel, as shown in 2 of figure 122, until the nicks are removed and the end squared up. Now, shape the sides of the screwdriver on the side of the emery wheel.

Be sure to dip the screwdriver tip in water frequently, between short periods of grinding, to keep from overheating it. Do not remove any more material than absolutely necessary. Another tool that you will use frequently and know how to sharpen is the half-hatchet.



1. SHAPING THE FACE



2. SHAPING THE TIP

Figure 121. Sharpening the Screwdriver

Half-Hatchet. The half-hatchet is commonly called simply a hatchet. It must be kept sharp, or it becomes a very dangerous tool to use. The blade can be sharpened on an emery wheel or on a grindstone.

The cutting edge can be beveled on both sides or beveled on one side, as shown in figure 122. The single bevel is better for cutting along a line. The double bevel works well on rough work, such as sharpening of grade stakes or form stakes.

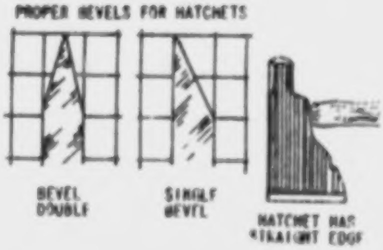


Figure 122. Half-Hatchet Cutting Edge Shapes

Power Tools

Special equipment is required for sharpening and maintaining power tools satisfactorily. There are numerous types of equipment available--so many, in fact, that it would be impossible to cover all of them in this publication. Therefore, it is recommended that you read and follow the instructions in the technical publications available for the equipment you are sharpening and the particular sharpening equipment you are using.

This section includes minor maintenance and some hand sharpening or honing which can be done to keep your equipment sharp and "keen" in between regular sharpenings. If includes maintenance on circular saws, bandsaws, jointers and planers, shapers, and routers.

Circular Saws. The most important factors in the care and maintenance of a circle saw are the proper lubrication of all moving parts and the proper conditioning of the saw blade. A saw blade which is dull, or one in which the teeth are incorrectly shaped or improperly set, will "labor" when cutting wood. This, in turn, puts an excessive strain on the driving mechanism. Figure 123 shows the correct shapes of ripsaw and crosscut saw teeth. In a combination saw, the rip or raker teeth and the crosscut teeth are shaped like the teeth of a crosscut handsaw, as shown in figure 124. The front and back slopes of a circular ripsaw tooth are filed almost square across and almost vertical, while the front and back slopes of a circular cutoff saw are beveled, as shown in figure 123.

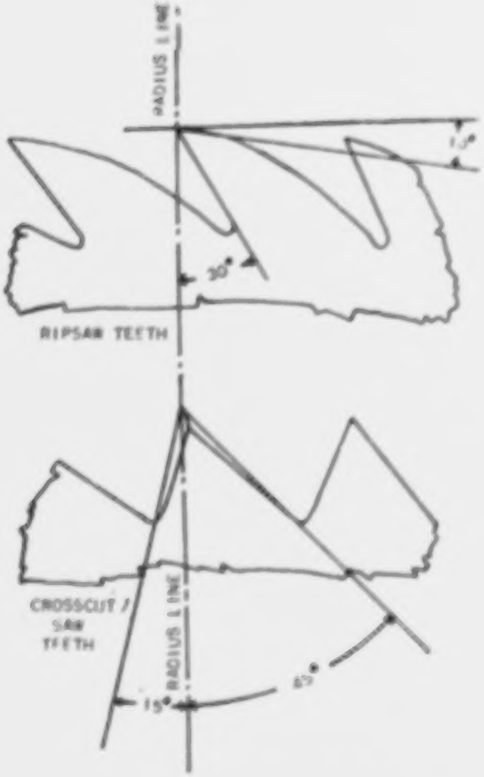


Figure 123. Correct Shapes of Ripsaw and Crosscut Saw Teeth

Complete reconditioning of a circular saw consists of (1) jointing, (2) gumming, (3) setting, and (4) sharpening, just as with a handsaw. To joint (make the teeth the same length) a circular saw, (1) secure a piece of an old grinding wheel, (2) adjust the saw so that the teeth extend about one-half inch above the table, (3) put on goggles, (4) start the saw, (5) place the grinding wheel flat on the table, and move it toward the revolving teeth until the higher points begin to strike the stone, and (6) move the stone gradually forward until all of the teeth points are striking the stone. Stop the saw at intervals and examine the points. When every point shows a bright spot, the jointing operation is completed

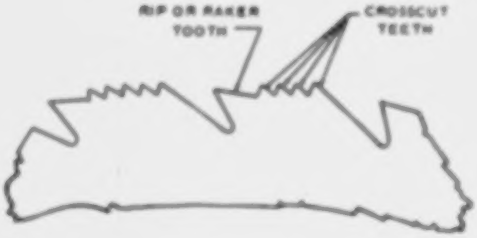


Figure 124. Combination Saw Teeth

Gumming, filing the gullets deeper, is done when wear and repeated sharpenings have caused the teeth to become too short. This job should be done with special jigs of equipment and by an experienced operator. If your saw needs gumming, send it in for machine sharpening.

Circular saws must be set in order to cut a kerf wide enough to give clearance to the saw blade. It is important that the saw be properly set, because it may otherwise bind in the wood and throw the wood back toward the operator with tremendous force (kickback).

Some of the thinner gage blades can be set with a handsaw sawset by following the same procedures as when sharpening a handsaw. Special sets can be obtained for heavier gage saws. A saw can be set by striking it with a hammer while the saw is held over an anvil, as shown in figure 125.

The spindle must be located where one-third of the length of each tooth will project over the beveled edge of the anvil. Hold a flat-ended punch on the tooth to be set and strike it a sharp blow with a hammer. Skip one tooth, and set the next one, until half of the teeth have been set on one side of the saw. Reverse the saw blade, and set the teeth on the other side of the saw blade.

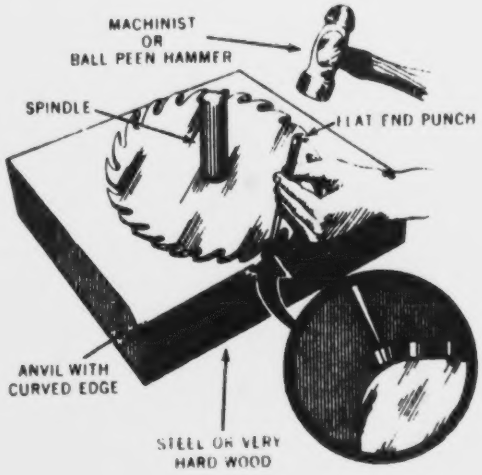


Figure 125. Setting a Saw Tooth

Some commercial saw-setting machines are available where the punch is fixed directly over the anvil, while others have a trip hammer arrangement to set the teeth. With the exception of special purpose saws, such as the dado head, and those that are hollow ground, all circular saws should be set.

Circular saws should be filed by machine when machines are available. Following the instructions in the technical publication for that particular machine.

To sharpen a circular ripsaw, you first fasten it in a vise and file the front edges of the teeth straight across. Use a flat mill file with a rounded edge for this work to prevent the file from filing sharp corners in the gullets. Then file the teeth set away from you on their top edges. Some woodworkers file them straight across, while others perfer to bevel them slightly. File the top edges of the teeth until the flattened points produced by jointing have disappeared. Reverse the saw in the vise and file the rest of the teeth.

To sharpen a circular crosscut saw, clamp it in a vise and file the teeth that have their beveled edges toward you. Use a slim taper, triangular file for this work. Follow the original angle of the bevels. If the saw was jointed, file away half the flat point, reverse the saw in the vise and file the rest of the flat point from the other side. In addition to the circular saw, the bandsaw is a very convenient tool for you to use as a carpenter, if it is kept in good operating condition. Let's see how to maintain it.

Bandsaws

Most carpenter shops have access to power equipment to joint, set, and file bandsw blades. It can be done by hand, but it is a slow and laborious process. If you are required to sharpen a bandsaw blade, you can do it in a manner similar to sharpening a rip handsaw; the teeth are shaped similarly.

Most of the shapening machines for bandsaws have a brazing device incorporated in them to join and weld the ends together. Follow the manufacturer's instructions or the instructions in the technical manual on your machine to perform this job.

Jointers and Planers

Straight knives are used on jointers, planers, and sometimes shapers. Like chisels and plane irons, these knives are sharpened only on one side. The larger and modern jointers and planers are equipped with a knife grinding attachment, which enables you to sharpen the knives without removing them from the cutterhead. This procedure keeps the blades balanced. Different models are operated in different manners; therefore, you must consult the technical manual for the particular type of machine you are using.

Most jointers and planers, however, are sharpened in the following manner:

1. Lock the cutterhead in position with the steel pin provided for this purpose. This steel pin will lock it in as many positions as there are knives in the cutterhead.

2. Bolt the motor of the grinder to the saddle which slides on a steel bar. Move it back and forth across the knife by operating the crank which turns a screw.

3. Grind all of the knives; then remove the grinder and replace it with a whetting device. Set the whetstone so that it barely touches the knives when the cutterhead is rotated by hand.

4. Turn the jointer or planer on and slide the whetstone back and forth on the sliding mechanism and it will whet the blades.

On older and smaller jointers and planers, you must remove the blades from the cutterhead. Some grinders are equipped with a sliding carriage attachment to sharpen knives such as this; but if the grinder is not so equipped, you can sharpen the knives with a jig, such as the one shown in figure 126. The protrusion on the jig slides back and forth in the slot in the tool rest so that the knife will be sharpened evenly the full width of the blade.

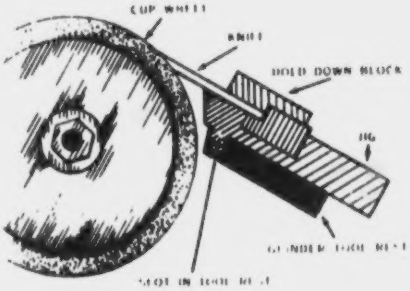


Figure 126. Jig for Grinder Jointer Knives

After you sharpen all of the *blades evenly, you can whet them* with an oilstone by using a jig, such as the one shown in figure 127.

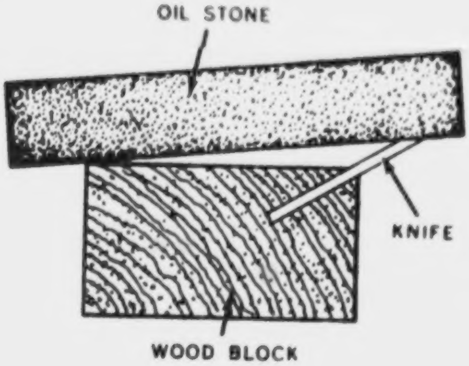


Figure 127. Whetting Jointer Knives

Shapers

Shaper knives are of several kinds: plain, straightedge knives; three-lip cutters; shaped, flat knives; and knives milled on the back. Shaper knives, with striaght, plain edges, are sharpened like jointer knives. Three-lip cutters must be sharpened on a special grinding machine where they can be mounted on a shaft. Attachments for portable routers are available to perform this type of work. Shaped flat knives used between shaper collars are ground on emery wheels of various shapes. Use a template of the shape desired so that each knife will be the same shape. Shaper knives, milled on the back, are sharpened in a manner similar to jointer knives.

Routers

Router bits are sharpened on the inside with small grinding wheel of different shapes, which are held in the chuck of the router. The bit held is in a special sharpening attachment.

SUMMARY

This study guide has covered the importance of keeping your tools in good shape and how to perform any maintenance that these tools may need. Remember, a craftsman is judged not only by the work that he does, but by the condition of his tools. You are the only one who can do the work and the only one who can keep your tools in the fine condition required to do the job.

QUESTIONS

1. What type of saw is used to make cuts parallel to the grain?

2. Which type of saw is used for interior and exterior cuts on molding?

3. Which type of plane is used for end grain planing?

4. Planing should be accomplished with/against the grain.

5. What determines the size of a hammer?

6. What type of mallets should be used to strike wood chisels?

7. How is the size of an auger bit indicated?

8. What type of drill is most often used to install finish hardware?

9. Which carpenters square is most commonly used during building layout and erection?

10. If a vial is installed crosswise in a level, it is used to check which type of surface?

11. What are the two basic kinds of wood chisels?

12. What is used to clean files or rasps that become clogged?

13. What type of screwdriver is used to secure screws located in an awkward position?

14. Which type of pliers has a two-position jaw pivot?

15. After cleaning your tools and equipment, what treatment is recommended for the wooden handles?

16. Why should a craftsman know how to replace handles on tools?

17. How would a broken saw handle be repaired if a new one was not available?

18. How should mushroom chisels be repaired?

19. What other tool is sharpened the same as a wood chisel?

20. What does jointing a saw mean?

REFERENCES

TO 32-1-101, Maintenance and Care of Hand Tools
TO 32-1-151, Hand, Measuring, and Power Tools
Textbook: Modern Carpentry, The Goodheart-Willcox Co., Inc.

3700 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-I-8

SECURITY

OBJECTIVE

a. Given incomplete statements, identify the OPSEC vulnerabilities, of AFSC 552X0 by completing the statements. Three of five responses must be correct.

INTRODUCTION

Operational security (OPSEC) is a new plan which views and puts to use rules to give our communication security information, security of property, and to keep useful information from the enemy.

Story of OPSEC: It was first used in the Southeast Asian war. It was made from a group of ideas thought up to find and to keep useful information from the enemy. Without information, the enemy does not have time to plan an attack.

INFORMATION

(OPSEC)

OPSEC is not like other Security Programs. You have learned that communication is a must for doing any job and security of communication has to be done by everyone. COMSEC and OPSEC are not the same, but they are similar and they cannot be kept apart. A trained agent can take bits and pieces of information and put it into a useful pack of information for an enemy to make plans for attack. Information is kept from the public only in the interest of the security of the nation. The security system we use is made by an order of the President. The total security is the sum of the way each person carries out good security practices. Physical security is about threats of damage to any type of Air Force property at each of its bases. It will be the duty of Air Force porperty at each of its bases. It will be the duty of Security Police or the ones who use the property to take care of the physical security of Air Force property.

You need to know about priorities if you are to keep information from the enemy. There are three priorities.

Priority A is the highest of the priorities. It is about weapon systems that are in alert status and which stand ready to be launched against the enemy, and to parts of tactical command/control warning property and communications units which are needed for alert force use, and to all of the nuclear weapons.

Priority B is the second highest of the priorities. This one is about main parts of weapon system which are not on alert status, but are on bases or sites from which they could be launched for direct strikes against an enemy.

Priority C is the third of the priorities. This one applies to combat aircraft and missiles which are not ready to be launched against an enemy because of the condition of their location. Priority C is also for special operations and also for aircraft made for direct support of combat personnel or aircraft needed to keep combat personnel in a general or limited war.

The following words are important for all personnel:

"Helping Hand"- a report ot higher headquarters that an enemy event is possible, involving A or B resources. It is your duty to give help for a Helping Hand alarm.

Covered Wagon Report - a report to higher headquarters of a most serious threat involving priority A or B resources.

When you find out about a possible or an actual enemy event, you should sound the alarm by shouting, "Helping Hand" three times. This tells other personnel in the area that they are to help also.

As soon as you send the alarm, two things must be done. First tell the Central Security Control. They will try to get the suspect, if there is one. Second, tell them the nature and exact location of the event by the best communications means possible, such as: security telephone, radio, or base telephone.

Personnel who are not out to control the suspect should search their areas for damages or suspicious objects near their area and tell this to the Security Alert Team (SAT) when they come.

Common OPSEC Vulnerabilities

Operational Indicators:

1. Sterotyped sequences of events made up of various phases of the operation.

2. Coordination with agencies that do not have safeguards for sensitive information.

3. Submission of unclassified reports at specific intervals to specific units or levels of command.

4. Sterotyped patterns of flight activity at a particular location.

Procedural Indicators:

1. Public information releases.

2. Posting of operational plan information in unsecure areas.

3. Posting of rosters, transportation schedules, and dining hall schedules in unsecure areas.

4. Distinctive emblems or paint on vehicles, buildings, or aircraft.

5. Markings on supplies which could reveal the location or starting date of the operations, such as nicknames, delivery deadlines, etc.

6. Build-up or positioning of support material and facilities.

7. Special meeting or religious services.

8. Use of nicknames is hazardous since they provide an easily recognizable flag for identifying an operation.

9. Exercising or testing portions of a plan.

Communications Indicators:

1. Plain language comunications associated with a planned operation and conducted during the planning, preparatory and execution phases.

2. Use of unchanging or infrequently changing call signs and/or radio frequencies.

3. Sterotyped message characteristics which are indicative of particular types of military activity.

4. A significant increase or decrease in message traffic volume.

5. Activities of new communications facilities in support of an operations plan.

OPSEC significance of unclassified data and procedures:

1. Unclassified information must be protected to provide security for operations.

2. Security safeguards must be continued through the execution phase of an operation.

3. All personnel must be made aware of the dangers of giving valuable information to the enemy by any type of media and by what they say or do during on-duty and off-duty hours.

4. Each person has the individual responsibility to develop an awareness of activities that the enemy can identify and use to his advantage.

5. OPSEC surveys should be conducted to determine OPSEC weaknesses, and corrective action should be taken to correct these findings.

SPECIFIC OPSEC VULNERABILITIES OF THIS SPECIALTY

There are OPSEC vulnerabilities related to the daily work of Air Force carpenters. You will do many things which will possibly gain you information which would be vulnerable to OPSEC. The most common example would be if you were assigned a job in an area such as alert facilities, aircraft hangars, base operations buildings, or command post facilities. In any one of these areas, you may learn such information as alert status of aircraft, duty rosters of alert crews, and other related information. You may observe aircraft being camouflaged, materials being loaded on aircraft or stockpiled to support upcoming operations. You may also have access to construction plans and specifications that contain vulnerable information. Examples of such information include: locations of fuel and ammunition, power plants, radar units, etc.

SUMMARY

An effective OPSEC program carried out by each individual assigned to a unit can prevent intelligence information from reaching the enemy.

QUESTIONS

1. What is the purpose of OPSEC?

2. Who establishes the security system?

3. Who is responsible for physical security of Air Force resources?

4. What resource priority would an aircraft have if it is not operational because of its location?

5. What resource priority is involved with a Helping Hand and Covered Wagon report?

6. What two things must be done after sending a Helping Hand report?

7. Give an example of each of the following:

   a. Operational indicator

   b. Procedural indicator

   c. Communication indicator

8. List three vulnerabilities of this career field.

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SG J3ABR55230 000-I-9

CONSTRUCTION USING HAND TOOLS

OBJECTIVE

a. Given a task and construction materials and working as a member of a team select and use hand tools to complete the task with no more than four instructor assists. Hand tools must be used correctly and finished project must be within 1/8" of square and within 1/8" of dimensions shown on student's rough plan. All joints must fit tightly.

b. Given construction tools and equipment, a task and working as a member of a team select the required materials to complete the assigned task. All safety precautions pertaining to use of ladders and lifting and handling of materials will be observed.

INTRODUCTION

How can you tell a good craftsman from a poor one? One way of telling is to watch how he handles his tools. If they are sharp and well maintained and he handles them with confidence, chances are you'll be observing a competent carpenter.

ASSIGNMENT

Read the following material in the textbook, Modern Woodworking.

1. Unit 2, Selecting and Roughing Out Materials, pages 21 thru Laying Out and Cutting Plywood, page 31, and answer questions 1-12 on page 34.

2. Unit 5, Wood Joints, pages 59 thru page 72, and answer questions 1-15, page 73.

3. Unit 9, Sanding and Preparing for Finish, pages 111-117.

SUMMARY

The selection of material for you project is as important as the work being accomplished. They both affect the finished product.

REFERENCE

Textbook: Modern Woodworking, The Goodheart-Willcox Co., Inc.

WORKBOOK
J3ABR55230 000-I-2 thru I-9

Technical Training

Carpentry Specialist

INTRODUCTION TO CARPENTRY

May 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use

DO NOT USE ON THE JOB

ATC FORM 214 (JAN 76)   OBSOLETES ATC FORMS 214, MAY 69, 522, NOV 63 AND 523, MAY 71.   STANDARD COVERSHEET

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This workbook contains the measurement devices designed to ensure that you have mastered the required tasks and knowledges as reflected in the current training standard.

The workbook will be controlled by the instructor at all times and will be used to evaluate your attainment of objectives. Upon completion of each workbook exercise, your response or actions will be graded and annotated as satisfactory (S) or unsatisfactory (U) on the criterion checklist. You must attain a satisfactory grade on all objectives in each instructional unit for the entire block, prior to being administered the end-of-block written test.

This workbook will remain the property of the course and will be destroyed upon satisfactory completion and annotation of objectives in the criterion checklist.

UNDER NO CIRCUMSTANCES will you be allowed to remove this workbook from the classroom and/or training area as applicable unless under the direct supervision of your instructor.

Supersedes WB J3ABR55230 000-I-2 thru I-9, June 1985
(Copies of superseded publications may not be used.)

TECHNICAL PUBLICATIONS

COURSE: J3ABR55230 000

PC: I-2a

PROJECT OR TASK: Locating Standard Publications in AFR 0-2

OBJECTIVE:

Given AFR 0-2, locate standard publication numbers and titles in numerical index. Seven of ten responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-2a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check using AFR 0-2.
4. You must provide correct responses to 7 of 10 items on this progress check.
5. Return the completed progress check to your instructor.
6. You instructor will grade the progress check using ATC Form 98, Student Progress Checklist using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for you to review.
8. After you have reviewed the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (PERFORMANCE)

Using AFR 0-2, locate standard publication numbers and titles in numerical index.

1. AFP 50-6____
2. AFR 127-12_______________________________________
3. AFR 92-1____
4. AFR 39-29_______________________________________
5. AFM 85-16_______________________________________
6. AFP 143-8_______________________________________
7. Support for Civil Air Patrol____________________________
8. Air Force Academy Preparatory School________________________________
9. Combat Search and Rescue Procedures_________________________________
10. Flight Weather Briefing_______________________________________

Course: J3ABR55230 000

PC: I-2b

PROJECT OR TASK: Locate Information in Commercial Publication

OBJECTIVE:

Given commercial publications and a list of carpentry tools and equipment, locate desired information in the commercial publication. Eleven of fifteen responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-2b
2. You are to work individually while completing this progress check.
3. Use the GSA Stock Catalog and Sears Specialog Power and Hand Tools to complete this progress check.
4. You must provide correct responses to 11 of 15 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After you have reviewed the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(PERFORMANCE)

1. Using a SEARS POWER AND HAND TOOL CATALOG, General Index, locate the following tools and the cost of each item. Enter this information in the blank spaces provided below.

ITEM	PAGE NUMBER	COST
a. Dual-Motion Sander 1/2 HP with dust pick-up		
b. Belt Sander, Heavy-duty 1-1/2 HP, with dust pick-up		

c. Sanding Belts, 4 X 24
inches Medium Grit, cloth backed
Wt. 2 oz. ____________ ____

d. Angle or Stair Gauge
Brass, Pkg of 2, 4 oz ____________ ____

e. Lathe Accessories
1/2" spear point 8 oz. ____________ ____

2. Use GSA Stock Catalog to answer the following statements.

a. To locate a carpenter's framing square, you first look in the index under the subject ________________.

b. The unit of issue for the carpenter's framing square is ___________.

c. The index heading and subheading used to locate a 1 pound curved claw hammer with a bell face is ______________________________________.

d. The stock number for the hammer described in item 3 is ____________.

e. The price for TWO router planes is ______________.

COURSE: J3ABR55230 000

PC: I-2c

PROJECT OR TASK: Locate Information in AF Publications

OBJECTIVE:

Given AFR 85-1, AFM 85-4, and AFP-85-1, locate desired information in the publications. Five of the seven responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-2c.
2. You will work individually while completing this progress check.
3. Use AFP 85-1, AFR 85-1, and AFM 85-4 to complete this progress check.
4. You must provide correct responses to 5 of the 7 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After you have reviewed the progress check, return it to your instructor. Progress chécks are CONTROLLED ITEMS.

MISSION I

(PERFORMANCE)

Using AFR 85-1 , AFM-85-4 and AFP 85-1, locate desired information in the publications.

1. Using AFR 85-1 locate the purpose of the Resources and Work Force Mangement Publication.

2. Using AFP 85-1 determine when a tourniquet will be used and at which pressure point the tourniquet would be applied to control lower arm bleeding.

____

____

3. Using AFM 85-4 locate and identify five types of pitched trusses.

a. ______________________

b. ______________________

c. ______________________

d. ______________________

e. ______________________

SAFETY

COURSE: J3ABR55230 000

PC: I-3a

PROJECT OR TASK: Analyze Hazards

OBJECTIVE:

Given situations involving electrical hazards, analyze the hazard and explain the required safety precautions.

INSTRUCTIONS:

1. This is Progress Check I-3a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress checks using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Using the following situations, identify the electrical hazard in each situation, analyze the hazard, and explain the required safety precautions.

SITUATION 1

You are framing a roof using a circular saw to trim the sheathing. Suddenly, a storm comes up and it begins to sprinkle. You are almost finished with your job, so you continue using the circular saw. You want to finish the roof before it starts raining harder.

A. The identified hazard is ______________________________

____

____

B. It is considered a hazard because ______________________________

____

____

C. Required safety precautions include ____________________________

____

____

SITUATION 2

Your supervisor has sent you to Base Housing to repair a loose cabinet door. You discover you must drill new holes in the cabinet to install a different type hinge on the door. You start to plug your drill into the outlet when you discover your drill has 3 prongs on its cord and the outlet will only accept a 2 prong plug. You remove one prong from your drill cord and start working.

A. The identified hazard is ____________________________________

____

____

B. It is considered a hazard because ______________________________

____

____

C. Required safety precautions include ____________________________

____

____

SITUATION 3

Your supervisor sends you to a hangar to repair a tool bin. You smell fuel and observe that the area where you are working is used to store jet fuel. You take out your electric drill and begin working on the tool bin.

A. The identified hazard is ______________________________

____

____

B. It is considered a hazard because ______________________________

____

____

C. Required safety precautions include ______________________________

____

____

SITUATION 4

Your supervisor sends you to the Commissary to repair a broken shelf. You get out your electric saber saw to cut the plywood needed to replace the shelf. You notice that the cord to the saber saw is almost broken and the wires are exposed. You are hungry (it's almost lunch time), so in order to save time, you use the saber saw.

A. The identified hazard is ______________________________

____

____

B. It is considered a hazard because ______________________________

____

____

C. Required safety precautions include ______________________________

____

____

COURSE: J3ABR55230 000

PC I-3b

PROJECT OR TASK: Handling Asbestos Materials

OBJECTIVE:

Given incomplete statements, specify saftey procedures for working with products containing asbestos fibers.

INSTRUCTIONS:

1. This is Progress Check I-3b.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress checks using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress checks to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the following statements pertaining to the safety procedures for working with products containing asbestos fibers.

1. Use the ____________ ___________ for directions when working with materials containing asbestos fibers.
2. When working with materials containing loose asbestos fibers you must wear _________, ___________, and protective clothing.

3. Asbestos fibers may be found in ___________, ___________, ___________, and _______________.

4. Asbestos exposure (does/does not) normally occur when asbestos is modified by a bonding agent. CIRCLE THE CORRECT ANSWER.

5. Asbestos exposure (does/does not) normally occur when the asbestos fibers become airborne. CIRCLE THE CORRECT ANSWER.

COURSE: J3ABR55230 000

PC: I-3c

PROJECT OR TASK: Report and Correct Safety Hazards

OBJECTIVE:

Given incomplete statements, specify procedures used in identification, reporting, and correcting safety hazards.

INSTRUCTIONS:

1. This is Progress Check I-3c.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

1. Report a hazard FIRST to your ________________.

2. The form used at the base level to report a hazard is AF Form _______.

3. The person responsible for correcting a hazard is the ________________.

4. An electrical cord strung across a hallway is a(an) ___________ hazard.

5. An open can of contact cement left on a shop table is a/an _________ hazard.

COURSE: J3ABR55230 000

PC: I-3d

PROJECT OR TASK: Completing AF Form 457

OBJECTIVE:

Given a situation involving a safety hazard and AF Form 457, report the hazard by completing AF Form 457 with no more than two instructor assists.

INSTRUCTIONS:

1. This is Progress Check I-3d.
2. You are to work individually to complete this progress check.
3. Use the situation given in the progress check as your guideline for completing AF Form 457.
4. Complete only the portions of the AF 457 applicable to the person REPORTING the hazard.
5. Your report must clearly identify the hazard. From the information you give in your report, the receiver must be able to determine what action he/she must take to ensure the hazard is investigated properly and in a timely manner.
6. Return the completed Progress Check to your instructor.
7. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Your instructor will return the graded progress check to you for review.
9. After the review, return the progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Performance)

Using the situation given, report a hazard by completing AF Form 457, USAF Hazard Report. Your completed report must: (1) Clearly identify the problem, (2) Indicate any actions that may have been taken to eliminate the hazard or protect people from the hazard, (3) Include any information you think might help the receiver, correct the hazard.

SITUATION

The masons had been pouring a concrete floor for a bath house at the NCO swimming pool. Sgt Smith reached to turn off the light and received an electrical shock. This event took place at 1500 hours 3 June 1985. The masons then noticed that just by touching the wall, they would receive a slight electrical shock. The supervisor told Sgt Smith to send a Hazard Report to SPSC/203.

USAF HAZARD REPORT	HAZARD REPORT NO. *(Assigned by Safety Office)*

I. **HAZARD** *(To be completed by individual reporting hazard)*

TO: CHIEF OF SAFETY *(Organization and location)*	**FROM:** *(Optional - Name, Grade and Organization)*

TYPE - MODEL, SERIAL NUMBER, A.G.E./MATERIAL/FACILITIES/PROCEDURE OR HEALTH HAZARD INVOLVED

DESCRIPTION OF HAZARD *(Date, Time, SUMMARY - Who, What, When, Where, How)*

RECOMMENDATIONS *(Originator - Not Mandatory)*

DATE RECEIVED	REVIEWING PERSON *(Typed or printed name, grade, and position or title)*	SIGNATURE	DESIGNATED OPR
DATE FORWARDED			SUSPENSE DATE

AF FORM 457

II. INVESTIGATION OF HAZARD

SUMMARY OF INVESTIGATION

RECOMMENDATIONS (*Investigator*)

ACTION TAKEN

DATE	TYPED OR PRINTED NAME AND GRADE OF ACTION OFFICER	SIGNATURE

COURSE: J3ABR55230 000

PC: I-3e

PROJECT OR TASK: Hazardous Waste Storage

OBJECTIVE:

Given incomplete statements, identify requirements for hazardous waste storage by completing the statements.

INSTRUCTIONS:

1. This is Progress Check I-3e.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the following statements pertaining to the types, markings, and inspection requirements for hazardous waste storage.

1. The purpose of ________________ management is to protect human health and the environment.

2. Any portable device in which hazardous waste is stored, transported, treated, disposed of, or otherwise handled is referred to as a/an

___________________.

3. _____________ is the maximum time hazardous waste can be accumulated.

4. The definition of a (an) _____________ _____________ is that area in or near the workplace where hazardous waste is accumulated prior to turn-in to DPDO for disposal.

5. Hazardous waste containers must be inspected at least _____________.

BASE CIVIL ENGINEER ORGANIZATION AND CAREER FIELD ORIENTATION

COURSE: J3ABR55230 000

PC: I-4a

PROJECT OR TASK: CE Organization and Functions

OBJECTIVE:

Given incomplete and matching statements, identify the mission, organization, functions, and responsibilities of CE units. Eight of ten responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-4a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to 8 of 10 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the statements pertaining to CE organizational structure, functions, mission, and responsibilities.

1. The commander of the Base Civil Engineering Organization is refered to as

   the ________________________.

2. The primary duty of the commander of the Base Civil Engineering Organization is the _______________ and ____________ of the real property on the base.

Match the sections in A with the task performed by that section listed in Column B.

COLUMN A	COLUMN B
_____3. Operations	a. Tests fire alarm systems
_____4. Fire Protection	b. Develops Budget Estimates
_____5. Squadron/Adminstrative	c. Maintains CE Library
_____6. Family Housing Management	d. Review contracts
_____7. Financial Management	e. Controls Housing Referrals
	f. Directs work done by each work center
	g. Evaluates quality of service provided to CE customers

8. The work area in which the Carpentry Shop is located is

______________________.

9. The section in which Power Production and Sanitation are located is

______________________.

10. The work area in which the SMART team is located is ______________.

COURSE: J3ABR55230 000

PC: I-4b

PROJECT OR TASK: Property Accountability and Responsibility

Given incomplete statements, identify property accountability and responsibility by completing the statements. Eight of ten responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-4b.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to 8 of 10 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the following statements pertaining to property accountability and responsibility.

1. The obligation of each individual for the proper care of property belonging to the Air Force is known as ____________ ____________.

2. When government property is issued to you, you assume responsibility for the care and protection of that property. The property is then owned by

   ____

3. Any individual who has acquired possession of government property has

   ____________ ____________ for it.

4. Your responsibility to replace or pay for any government property lost, destroyed, or damaged while in your care is know as ________________ ________________ if the loss, destruction, or damage was a result of your carelessness, maladministration, or negligence.

5. When you are issued government property, ____________ records of accountability will be established by the person issuing the property.

6. Once you have been issued government property, you must maintain ________________ records to enable you to identify and keep track of the property issued to you.

7. The word pecuniary means ____________________.

8. If you find government property that has apparently been lost, stolen, or abandoned, you must ____

____

____

9. If you get mad and throw your entire tool box into a cement mixer, (you pay/the Air Force pays) for the tools. CIRCLE THE CORRECT ANSWER.

10. If a tornado strikes your house trailer and carries your tool box to who-knows-where, (you pay/the Air Force pays) for the tools. CIRCLE THE CORRECT ANSWER.

COURSE: J3ABR55230 000

PC: I-4c

PROJECT OR TASK: Structural/Pavements Career Field

OBJECTIVE:

Given incomplete statements, identify the organization of the structural/pavements career field by completing the statements. Eight of ten responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-4c.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to 8 of 10 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the following statements pertaining to the organization and duties of the Structural/Pavements career field.

1. The regulation which identifies the duties and responsibilities of a carpentry specialist is ________________.

2. The work area of the structures section whose duties include the laying of concrete block is the ____________ shop.

3. The shop responsible for painting doors is ______________.

4. The work area whose duties consist primarily of performing maintenance on a rotating schedule is the __________________.

5. The shop responsible for repairing leaking faucets is the ____________ shop.

6. The shop responsible for operating heavy equipment is the ___________ shop.

7. The shop responsible for framing partition walls is the __________ shop.

8. The shop responsible for constructing ductwork is the ____________ shop.

9. As a Carpentry Specialist, you (will/will not) have the responsibility of maintaining carpentry and woodworking tools. CIRCLE THE CORRECT ANSWER.

10. As a Carpentry Specialist, you (will/will not) need to know how to interpret blue prints. CIRCLE THE CORRECT ANSWER.

COURSE: J3ABR55230 000

PC: I-4d

PROJECT OR TASK: Duties, Responsibilities and Career Ladder Progression of AFSC 552X0

OBJECTIVE:

Given incomplete statements, identify the duties, responsibilities, and career ladder progression requirements of AFSs 55230/50. Six of eight responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-4d.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to 8 of 10 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the statements given below pertaining to the duties, responsibilities, and career ladder progression requirements of Air Force specialties 552X0/50.

Give the meaning of the 55250 AF Specialty

1. 55 ______________________________

2. 2 ______________________________

3. 5 ____

4. 0 ____

5. The duty title of AFSC 552X0 is ______________________.

6. The duty title of AFSC 55250 is ______________________.

7. To become a 55250, you must complete on-the-job training and a

______________ course.

8. You must acquire a skill level of _____________ before you can be promoted to the grade of E-4.

COURSE: J3ABR55230

PC: I-4e

PROJECT OR TASK: Engineered Performance Standards

OBJECTIVE:

Given incomplete statements, identify Engineered Performance Standards (EPS) by completing the statements. Eight of ten responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-4e.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to 8 of 10 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the following statements pertaining to specific terms, purposes, and definitions of Engineered Performance Standards (EPS).

1. A/An _____ time is for the amount of time it should take to perform a given job.
2. Engineered Performances Standard is a tool used by planners and estimators to allow for consistent ______________________ for maintenance work.

3. Most production work is __________ and the work place and methods are normally fixed.

4. The development of EPS (was/was not) accomplished by consulting supervisor's records of work orders completed by one individual in each work area. Circle the correct answer.

5. A _____________ presents data pertinent to work which is common in one particular craft.

6. Non-productive delays (are/are not) included in craft delay allowances. Circle the correct answer.

7. Craft delay allowances were determined by work _______________.

8. Travel time (does/does not) cover the time required for one worker to go from the shop to the job site. Circle the correct answer.

9. Additional material handling time (does/does not) apply to the time it takes workers to remove the debris or old equipment which has been replaced. Circle the correct answer.

10. _____ is designed specifically for maintenance type work.

CONSTRUCTION MATERIALS

COURSE: J3ABR55230

PC: I-5a

PROJECT OR TASK: Characteristics of Construction Materials

OBJECTIVE:

Given incomplete statements, identify the characteristics of construction materials by completing the statements. Twenty of twenty-five responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-5a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to 20 of 25 items.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Use the word list below to identify the construction materials described in the statements. Write the word you select in blank provided at the end of each statement.

WORD LIST

1-1/2" x 3-1/2"
1-3/4" x 3-3/4"
2" x 4"
3-1/2' x 7-1/2'
4' x 8'
6' x 10'
Birch
Box Nail
Casing Nail
Common Nail
Continuous Hinge
Cylinder Lock
Dead Bolt Lock
Douglas Fir
Dressed
Duplex Head/Scaffold
Finish Nail
Fire Exit Bolt (Panic Lock)
Hydraulic Door Closer
Mahogany
Maple
No. 1 Common
No. 5 Common
Nominal
Oak
Passage Lock
Pine
Plywood
Pneumatic Door Closure
Privacy Lock
Redwood
Rim Lock
Stove Bolt
Tubular Lock
Utility Hinge
Walnut
Wood Screw

1. The most common lumber used in stuctural framing and in door and window frames. ______________________

2. The type wood used to make dowel rods. ______________________

3. The type wood used in products that may be exposed to water.

____

4. The type wood used in cheaper framing and in cheaper plywood.

____

5. The type wood used in gunstocks and fine cabinet work.

____

6. The type wood used in bins or shelves and anywhere more strength or greater dimensions are needed. ______________________

7. The rough, unfinished measurement of lumber.

____

8. The best grade of lumber. ______________________

9. The most common size of a sheet of plywood. ______________________

10. The nail with the smallest head, thinnest cross section, and is designed to be set in wood. ______________________

11. The nail used for window and door casings. ______________________

12. The nail used for temporary construction. ______________________

13. The nail used in light work and toenailing. ______________________

14. This item is to be used when you need more holding power than you can get with a nail. ______________________

15. This hinge runs the entire length of the objects being joined.

____

16. Heavy duty exterior door lock. ______________________

17. Light duty exterior door lock. ______________________

18. Lock used on bedrooms and bathrooms; no key. ______________________

19. Lock with no locking mechanism; used in corridors, between rooms, or on closets. ______________________

20. Used on all public building exit doors. Opened with key from outside and with a bar from inside. ______________________

21. The door closer whose checking device is air and is used on lightweight doors. ______________________

22. Door closer used on heavy doors. ______________________

23. The nail used for most phases of building construction.

____

24. The actual size of a 2" x 4". ______________________

25. The type wood used for bowling lanes. ______________________

CONSTRUCTION DRAWINGS

COURSE: J3ABR55230 000

PC: I-6a

PROJECT OR TASK: Construction Drawings

OBJECTIVE:

Given building plans, determine the type, location, and configuration of carpentry work for the construction of the building.

INSTRUCTIONS:

1. This is Progress Check I-6a.
2. You are to work individually while completing this progress check.
3. You are to use the building plans in Unit 5 of the Modern Carpentry text to complete this progress check.
4. No instructor assists will be available for this progress check.
5. After completing the progress check, return it to your instructor.
6. You must provide correct responses to all items on this progress check.
7. Your instructor will grade this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Your instructor will return the graded progress check to you for review.
9. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(KNOWLEDGE)

Using Modern Carpentry, Unit 5, complete these statements.

1. The square footage of the first floor of the structure pictured on page 95 is ________________.

2. Figure 5-13, page 101, shows ______________ insulation is to be used in the ceiling.

3. The stair treads are __________ inches high.

4. The kitchen range is operated by gas/electricity. CIRCLE THE CORRECT ANSWER.

5. The ceiling joists for the ranch home are spaced ________ inches OC.

HAND TOOLS

COURSE: J3ABR55230 000

PC: I-7a

PROJECT OR TASK: Hand tools - Use, Identification and Maintenance

OBJECTIVE:

Given illustrations and statements pertaining to hand tools, identify the hand tools, their use, and the maintenance required. Twenty of thirty responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-7a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return them to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Knowledge)

Complete the following statements pertaining to the use, sharpening, and care of handtools.

1. The tool used to sharpen a plane iron is the ______________.

2. The tool used to restore a bevel or to repair the nicked edge of a chisel

   is the ________________.

3. When storing a plane iron, the blade must be withdrawn and the iron placed

   a. in a storage cabinet

   b. on its side

4. A broken handle on a hammer should be ________________.

   a. repaired

   b. replaced

5. To remove rust from a saw, you must use ________________.

   a. oil

   b. oil and fine emory cloth

   c. oil and sand paper

   d. WD-40 and a soft rag

6. The process of restoring vertical alignment to the teeth of a hand saw is know as __________________.

7. The process of bending the teeth on a handsaw so the kerf in the wood will enable the saw blade to run freely is called ________________.

8. When using a rip saw, (you must not/you must) exert a lot of pressure on the saw.

9. The primary use of the ________________ saw is for cutting openings in gypsum board to install electrical outlets.

10. The ____________ saw is often used for making corner joints for molding and for inside and outside curves.

11. The only hand saw carpenters should use when cutting nails or metal is the __________ saw.

12. When using a tang or paring chisel, (you should/you should not) use a wooden mallet when you need extra pressure.

13. The type bits used in a rachet brace are known as ________________ bits.

14. ______________ drills are used to drill holes 1/4 inch or less in diameter.

15. If the blade on a pocket tape becomes dirty or wet, it should be wiped clean with ____________________.

   a. Emory cloth

   b. Machine oil

   c. WD-40

   d. None of the above

16. The ____________ is an invaluable tool for carpenters. Some of its uses are: (1) checking squareness of materials; (2) laying out rafters, and (3) laying out stairs.

17. The __________________ is a very useful tool. It's primary use is layout lines for roof shingles.

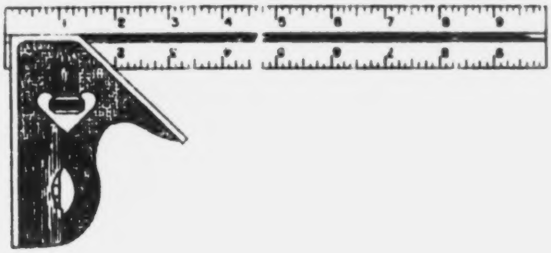
18. The ________________ chisel can be used both with hand pressure or with a mallet.

19. __________________ clamps can be opened to hold materials from 3 to 10 inches thick. When using this clamp, you do not need to use pieces of scrap to protect the material being clamped.

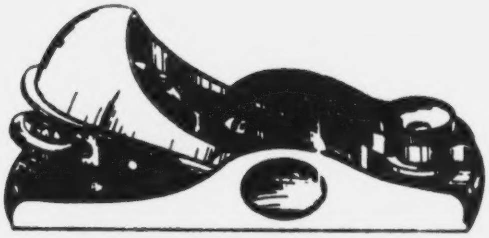
20. _________________ have a two-position jaw pivot and are used as a gripping or holding tool, for bending wire, and for removing nails too small to remove with a claw-hammer.

Identify each of the following illustrated tools by writing the name and use of each in the blank spaces provided.

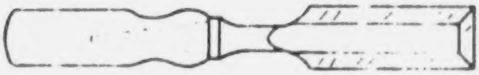
21. a. ________________ square b. Use __________________________



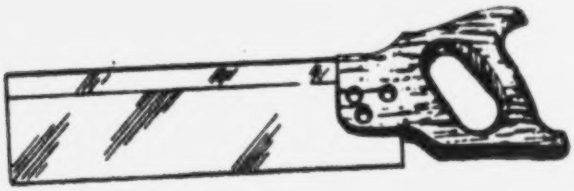
22. a. ________________ plane b. Use __________________________



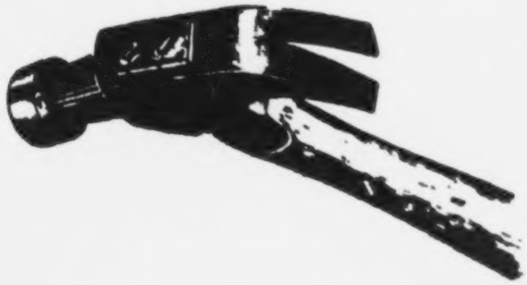
23. a. ________________ chisel b. Use __________________________



24. a. ________________ saw b. Use ____________________________



25. a. ________________ hammer b. Use ____________________________



COURSE: J3ABR55230 000

PC: I-7b

PROJECT OR TASK: Clean and Lubricate Hand tools/Machines

OBJECTIVE:

Given procedures, materials, hand tools, and machines, clean and lubricate the hand tools/machines as necessary with no more than two instructor assists.

INSTRUCTIONS:

1. This is Progress Check I-7b.
2. Two instructor assists will be available for this progress check.
3. Your instructor will provide you with all tools, machines, and cleaning and lubricating materials required for completing this progress check.
4. You must fulfill all obligations outlined in the instructions to MISSION I for this performance evaluation.
5. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
6. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I (Performance)

Using the procedures given below, clean and lubricate a set of hand tools and machines.

1. Check to ensure that your team has the following items:

    a. 1 handsaw

    b. 1 framing square

    c. 1 handscrew clamp

    d. 1 chisel

    e. 1 clean rag per group member

    f. 1 can of machine oil

    g. 1 can of linseed oil

    h. 1 sheet of fine emory cloth

    i. cleaning brush

2. Check your equipment for the following:

    a. Dirt and debris on the tools/machines

    b. Moving parts operate freely or without binding

    c. Rust on the tools/machines

3. Clean the tools as necessary following these procedures:

    a. If rust is present:

        (1) Put several drops of oil on the rusted area

        (2) Rub the area with the fine emory cloth until the rust is gone

        (3) When removing rust from a saw or chisel, take care not to cut yourself on the sharp areas of the tool

        (4) Follow cleaning procedures given under item 3b.

    b. Cleaning procedures for metal parts of tools/machines:

        (1) Apply a few drops of oil to a small area of the tool/machines.

        (2) Rub oiled area with a rag until the area is clean and the oil is gone.

(3) If the area is not clean, repeat steps (1) and (2) until the area is clean.

(4) Go to another area and repeat steps (1), (2), and (3) until the tool is clean.

c. Cleaning and/or preserving procedures for wooden parts of tools and wooden tool handles:

(1) Apply small amount (a few drops) or linseed oil to a clean rag

(2) Rub oil into the wooden portion of the tool.

(3) Using a clean rag, wipe excess oil from the tool.

4. Lubricate moving parts of handtools, machines as needed, using the following procedures:

(1) Check the tool/machine to see if moving parts operate freely and without binding.

(2) Check tool/machine for rust. If rust is present, oil the rusted area and brush the area with the brush issued to your group.

(3) Wipe the area with a clean rag.

(4) If rust is still present, repeat steps (2) and (3) until the rust is gone.

(5) Wipe excess oil from the tool.

(6) Repeat step (1). If tool/machine is not operating properly, repeat steps 2 through 5 until the tool operates freely and without binding.

5. Recheck all tools/machines to ensure they are clean and properly lubricated.

6. Ask your instructor to inspect your tools/machines.

7. After your tools have passed inspection, store the tools and materials and clean the area.

COURSE: J3ABR55230 000

PC: I-7c

PROJECT OR TASK: Shape and Sharpen Hand tools

OBJECTIVE:

Given hand tools, procedures, equipment and working as a member of a team shape and sharpen the hand tools, IAW procedures with no more than three instructor assists.

INSTRUCTIONS:

1. This is Progress Check I-7c.

2. Your instructor will assign you to a team for the completion of this progress check.

3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least one active position and will be evaluated in at least TWO meaningful tasks associated with the objective. Observing or reading a maintenance document does not fulfill this obligation.

4. Three instructor assists will be available for this progress check.

5. Your instructor will provide you with all tools and cleaning and lubricating materials required for completing this progress check.

6. You must fulfill all obligations outlined in the instructions to MISSION I for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member that could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. Return the completed progress check to your instructor progress checks are CONTROLLED ITEMS.

MISSION I (Performance)

Using the procedures given below and tools, materials, and equipment provided, sharpen the tools.

1. Check to ensure your team has the following items:

   a. 1 chisel or plane iron per student.

   b. 2 oil stones per group.

   c. 1 felt-tip marking pen per group.

   d. 1 trysquare per group.

   e. 1 can of oil per group.

   f. 1 clean rag per student.

   g. 1 pair goggles per student.

   h. 1 handscrew clamp per student.

   i. 1 piece scrap wood per team.

2. Shape chisels and plane iron blades as required using the following procedures:

   a. check squareness of bevel with trysquare.

   b. check for nicks on blade.

   c. with bevel down, use felt-tip pen and trysquare to mark the line you want to grind to.

   d. put on goggles.

   e. ask instructor to demonstrate using the grinding wheel.

   f. following procedures demonstrated by the instructor, use the grinding wheel to shape your plane iron blades and chisels.

   g. ask your instructor to check your plane iron blades and chisels for nicks and alignment of bevels.

3. Sharpen chisels and plane irons using the following procedures:

   a. clamp the oil stone to table using bench clamp or handscrew clamp.

   b. clean the oil stone by pouring oil over the stone and wiping the oil off with a rag until the stone is free of impurities.

c. Pour oil over the stone

d. Place plane iron blade or chisel on the stone in the following manner:

   (1) bevel down toward the stone.

   (2) iron or chisel parallel to the stone.

   (3) bevel flush with the stone.

   (4) hold the chisel with one hand on the handle and the other hand applying pressure to the back (top side) of the blade.

   (5) hold the plane iron with one hand at the end opposite the cutting edge and the other hand on the back (top side) of the blade.

e. Sharpen the blade by:

   (1) using the entire surface of the stone. Some people prefer to use a figure 8 pattern.

   (2) keep your arms and wrists stiff and move the blade across the stone by rocking your body back and forth on your feet.

   (3) continue step (2) until a burr appears on top of the cutting edge.

   (4) turn the chisel or plane iron over with the backside flat on the stone and drag the cutting edge across the stone and toward you until the burr disappears.

   (5) test the sharpness of the chisel or plane iron blade on the scrap wood. KEEP BOTH HANDS ON THE CHISEL OR PLANE IRON BLADE. Clamp the wood, if necessary. DO NOT TEST THE sharpness of either tool with your fingers, skin, or on someone else's body.

   (6) if the tools are sharp, ask your instructor to inspect them. If they are not sharp, repeat steps (1) through (5) until the tools are sharp.

4. After your instructor has inspected your tools and ascertained that they are sharp, store the tools and sharpening equipment properly and clean your work area.

COURSE: J3ABR55230 000

PC: I-8a

PROJECT OR TASK: OPSEC Vulnerabilities - AFSC 552X0

OBJECTIVE:

Given incomplete statements, identify the OPSEC vulnerabilities of AFSC 552X0, by completing the statements. Three of five responses must be correct.

INSTRUCTIONS:

1. This is Progress Check I-8a.
2. You must work individually and without instructor assistance while completing this progress check.
3. YOu must complete this progress check from memory, using no notes or other reference material.
4. You must provide correct responses to 3 of 5 items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. Return the progress check to your instructor after the review. Progress checks are CONTROLLED ITEMS.

MISSION 1

(KNOWLEDGE)

Complete the following statements pertaining to OPSEC vulnerabilities of AFSC 552X0.

1. OPSEC was first used in the War.
2. Priority is the highest OPSEC priority.
3. You are assigned a task in an aircraft hangar in an alert facility. You observe a duty roster of the alert crew. You return to your shop and discuss the construction work you are doing at the hangar with you supervisor. This (does/does not) violate OPSEC procedure.

4. The security system we use is made by an order of ____________________.

5. When you find out about a possible or an actual enemy event, you should sound the alarm by shouting _______________ three times.

CONSTRUCTION USING HAND TOOLS

COURSE: J3ABR55230 000

PC: I-9a

PROJECT OR TASK: Use Hand tools

OBJECTIVE:

Given a task and construction materials and working as a member of a team select and use the hand tools to complete the task with no more than four instructor assists. Hand tools must be used correctly and finished project must be within 1/8" of square and within 1/8" of dimensions shown on student's rough plan. All joints must fit tightly.

INSTRUCTIONS:

1. This is Progress Check I-9a. It will be completed concurrently with PC I-9b.
2. You must use the criteria outlined below to complete this progress check.
3. Your instructor will assign you to a team for the completion of this progress check.
4. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least TWO active positions, and you will be evaluated in at least TWO meaningful tasks associated with the objective. Observing or reading a maintenance document does not fulfill this obligation.
5. The instructor will grade you using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
6. Four instructor assists will be available for this progress check.
7. Your instructor will provide you with all materials needed for completing this progress check.
8. You must fulfill all obligations outlined in MISSION I for this performance evaluation.
9. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
10. Return the completed progress check to your instructor progress checks are CONTROLLED ITEMS.

MISSION I (Performance)

Using the task outlined below, materials, hand tools, and working as a member of a team, use the hand tools to accomplish the task.

TASK: Select and use hand tools to construct a small project. You may choose what you want to build, provided it satisfies the criteria listed below and is approved by your instructor.

CRITERIA:

1. The project must contain two of the following three joints: (1) Dado (2) Rabbet (3) Groove
2. You must draw a rough plan of the project giving dimensions, materials to be used, and other information which will allow your instructor to evaluate the finished project.
3. You must use both nails and glue in constructing your project.
4. Your project must be finish sanded and have the nails set and the nail holes concealed with wood putty.
5. The completed project must be within 1/8" of square and measure to within 1/8" of the dimensions shown on your rough plan.
6. All joints in the project must fit tightly and be smooth and within 1/8" of square.

COURSE: J3ABR55230 000

PC: I-9b

PROJECT OR TASK: Hand tool Safety

OBJECTIVE:

Given construction tools and equipment, a task and working as a member of a team select the required materials to complete the assigned task. All safety precautions pertaining to use of ladders, lifting and handling of materials will be observed.

INSTRUCTIONS:

1. This is Progress Check I-9b. It will be completed concurrently with PC I-9a.

2. Your instructor will assign you to a team for the completion of this progress check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least TWO active positions, and you will be evaluated in at least TWO meaningful tasks associated with the objective. Observing or reading a maintenance document does not fulfill this obligation.

4. No instructor assists will be available for this progress check.

5. You must fulfill all obligations outlined in this performance evaluation. You must observe all safety precautions.

6. Your instructor will grade this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

7. After completing this progress check, return it to your instructor. Progress checks are controlled items.

MISSION I (Performance)

You are to exercise safety precautions while using construction tools and while handling and storing lumber. Your instructor will be observing your performance as you:

1. Follow safety precautions while selecting and handling handtools.

2. Follow safety precautions while using/maintaining hand tools.
3. Follow safety precautions while handling and storing lumber.
4. Follow safety precautions while lifting heavy and/or cumbersome loads.
5. Follow safety precautions while using ladders.

STUDY GUIDE
J3ABR55230 000-II-1 thru 4

Technical Training

Carpentry Specialist

CABINET CONSTRUCTION

June 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use
DO NOT USE ON THE JOB

ATC FORM 214 (JAN 76) OBSOLETES ATC FORMS 214, MAY 69, 522, NOV 63 AND 523, MAY 71. STANDARD COVERSHEET

Purpose of Study Guide

This study guide (SG) is designed to guide you through your study assignment in the most logical sequence for easy understanding and to provide you with practical exercises or work in conjunction with each study assignment. Complete each exercise or work assignment in the sequence given and it will aid you in understanding and retaining the key points in each assignment.

Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following day prior to the days lesson. Questions will be addressed at that time. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

Study Guide J3ABR55230 000-II

Contents

Unit	Title	Page
1	Selecting and Cutting Materials For Cabinet Construction	1-1
2	Cabinet Assembly	2-1
3	Surface Sanding	3-1
4	Laminated Plastic	4-1

Supersedes SG J3ABR55230 000, December 1985.
(Copies of superseded publications may not be used.)

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-II-1

SELECTING AND CUTTING MATERIALS FOR CABINET CONSTRUCTION

OBJECTIVES:

a. Given power tools, materials, equipment and working as a member of a team exercise safety precautions while operating electrically powered tools and equipment.

b. Given procedures, a cabinet plan, power tools, equipment, materials and working as a member of a team cut materials to within ± 1/16" of specifications with no more than five instructor assists. Cutting must be accomplished in sequence using the correct power tool for each cutting task.

INTRODUCTION

Stationary power tools are usually fastened to the floor of a shop or mounted on the top of a work bench. When using power equipment, you must concentrate only upon operating that machine and follow the manufacturer's operating instructions. You should make all adjustments to any equipment prior to turning on or activating the equipment's power source. Be sure to use all guards and wear the safety equipment required for the tool you are using. Always know what you are going to do and what a specific tool will do before you attempt to use it. (CAUTION: You should never attempt to use any power equipment unitl your trainer or supervisor has certified you are qualified to use it.)

INFORMATION

STATIONARY POWER TOOLS

Radial Arm Saw

A radial arm saw is shown in figure 1. The motor and arbor of a radial arm saw pivot in a yoke assembly and can be turned in any direction. A swivel lock holds the saw motor in the desired position. The yoke slides back and forth along the carriage on the arm of the radial arm saw. The carriage can also be swung in any direction. These features make the radial arm saw adaptable to almost any type of cutting.

To crosscut, (see figure 2), or make cuts across the grain of the stock, the material is held rigidly on the table against the fence and the rotating saw blade is pulled through it. For ripping, the motor of the radial arm saw is rotated in the yoke so that the blade, or the line of cut, is parallel to the front edge of the fence. The material being cut is moved along the table and is fed into the blade for ripping. Here, the motor position is stationary and the material is moved, much the same as a table saw.

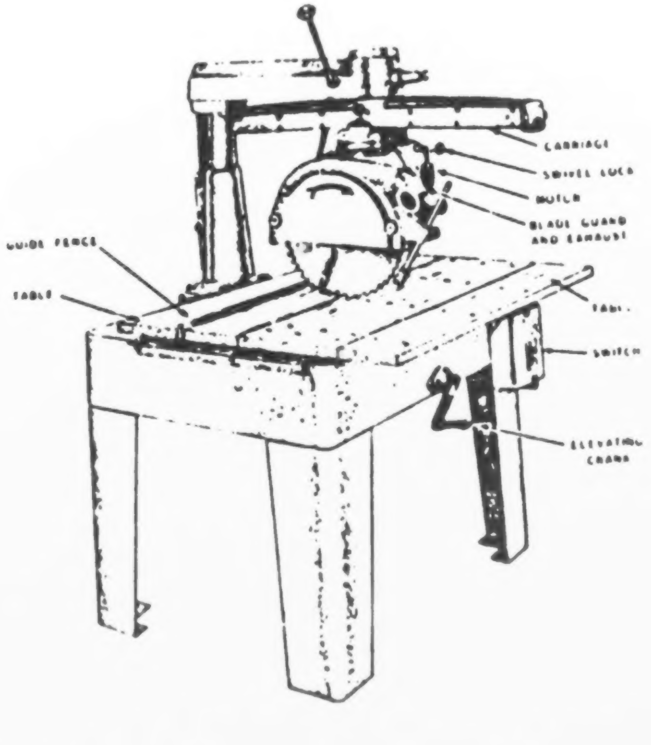


Figure 1. Radial Arm Saw

Figure 1. Radial Arm Saw

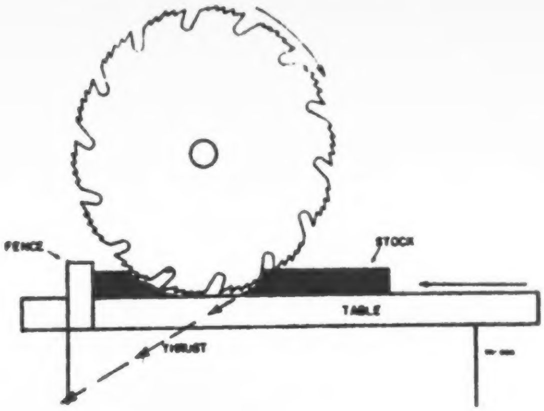


Figure 2. Cutting Material With a Radial Arm Saw

Surface Planer

Surface planers are either single or double surfacers. A single-surface planer, surfaces only the upper face of the material on one pass through the machine. Double surfacers can surface both faces of material at the same time, or on one pass of the material through the machine. But most planers in Air Force carpentry shops are single-surface type planers.

A single-surface planer is illustrated in figure 3. The cutterhead of the surfacer is similar to the one used on the jointer. The main parts of a surfacer are the table, the rollers, and the cutter assembly (see figure 4.)

The table has three parts: an infeed table, a center table, and an outfeed table. There are two sets of rollers: an upper and lower infeed roller set and an upper and lower outfeed set. The upper outfeed roller is smooth-surfaced and pulls the material out of the machine. Both of these rollers are geared to the same speed to produce a smooth and continuous movement of the material through the machine. The lower infeed roller is positioned between the infeed and center tables. The lower outfeed roller is similarly located between the center table of the outfeed table. The position of the top rolling surface of each of the lower rollers is slightly above the table surfaces to allow the material to move across the tables without binding or creating excess drag friction. The cutterhead is located in the machine assembly directly above the center table.

The surface planer alone, cannot remove warp from a piece of material. The pressure exerted by the rollers will temporarily straighten out a warped piece as it passes through the machine; but a warped piece that goes into the machine comes out still warped. This is not a defect in the machine. Surfacers are designed for surfacing only and not for trueing warped stock. If a true plane surface is desired, one face of the warped stock must be trued on the jointer before the piece is fed through the surfacer. If the face that goes down, when fed through the surfacer is true, the machine will then plane the upper face of the material true.

Jointer

The jointer, shown in figure 5, is a machine for power-plane stock on faces, edges, and ends. The planing is done by a revolving cutterhead, equipped with two or more knives, as shown in figure 6. Setscrews in the cutterhead are used to force the throat piece against the blades in the jointer and to hold the blades in position. Loosening the setscrews releases the blades for removal. The size of a jointer is designated by the length in inches of the knives. Sizes of jointers range from 4 inches to 36 inches.

You must periodically check the level of the jointer outfeed table, as shown in figure 7, to ensure that the surface of the outfeed table is exactly even with the highest point reached by the blades. If the outfeed table is too high, the cut will become progressively more shallow as the piece is fed across the jointer. If the outfeed table is too low, the piece will drop downward as its end leaves the infeed table, and the cut for the last inch or so will be too deep.

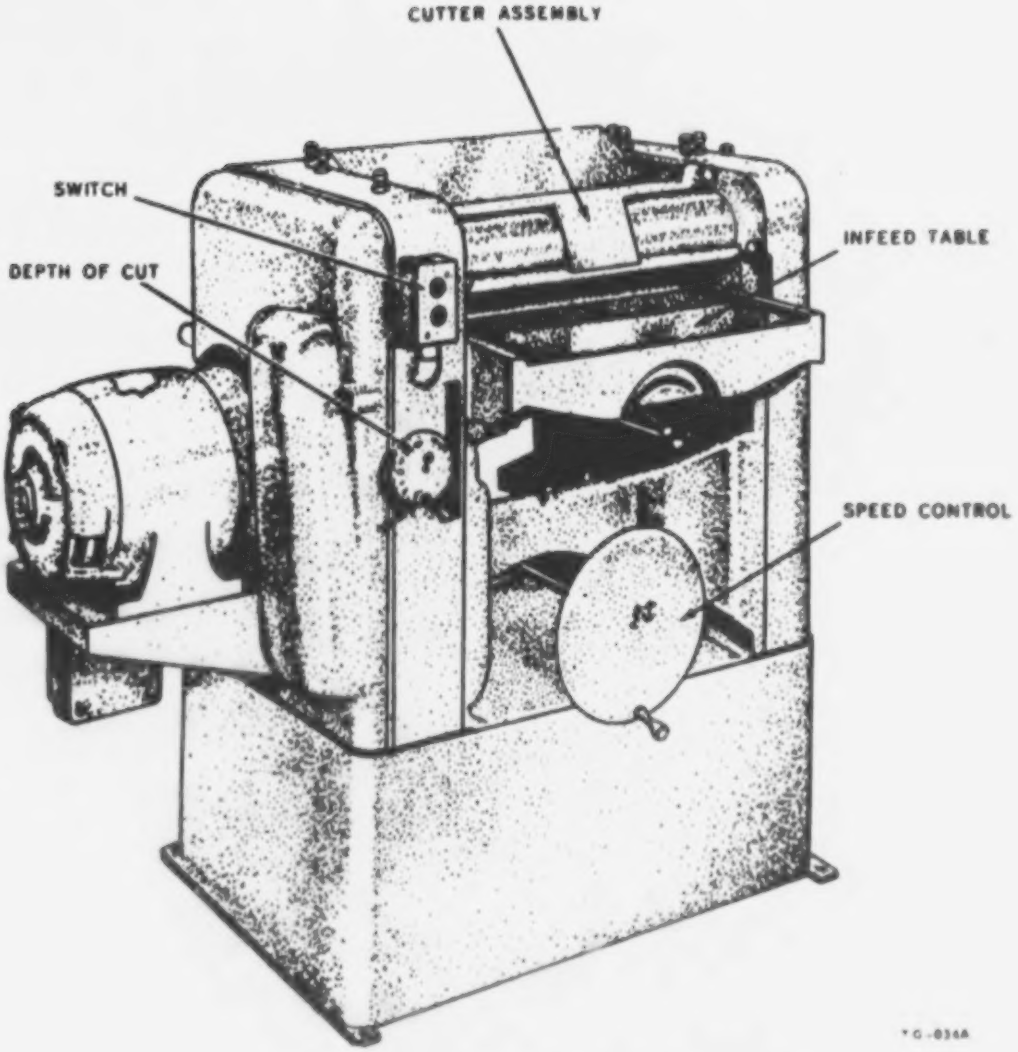

CUTTER ASSEMBLY
SWITCH
INFEED TABLE
DEPTH OF CUT
SPEED CONTROL
TG-036A

Figure 3. Parts of a Surface Planer

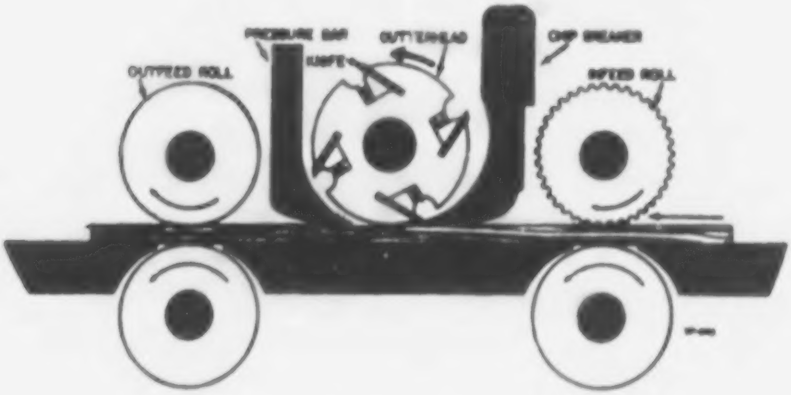

PRESSURE BAR
CUTTERHEAD
CHIP BREAKER
KNIFE
OUTFEED ROLL
INFEED ROLL

Figure 4. Surface Planer Operation

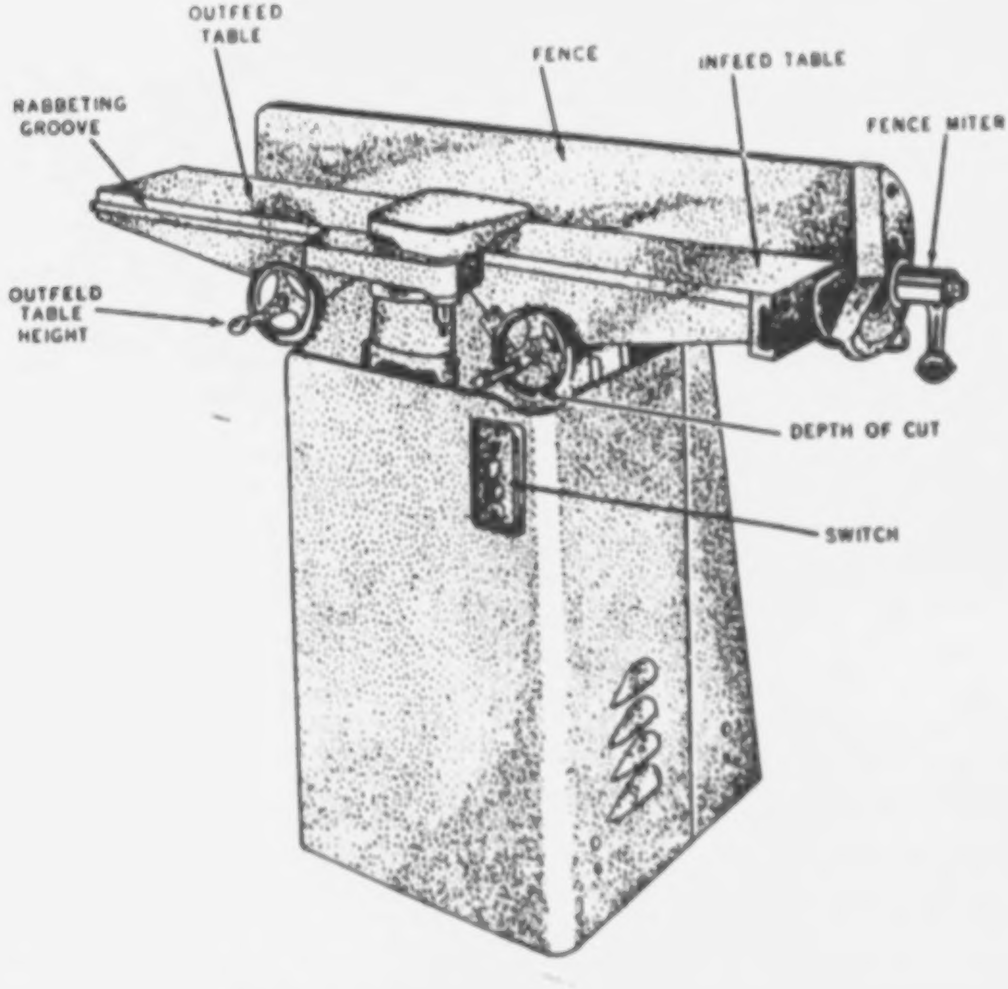

OUTFEED TABLE
FENCE
INFEED TABLE
RABBETING GROOVE
FENCE MITER
OUTFEED TABLE HEIGHT
DEPTH OF CUT
SWITCH

Figure 5. Parts of a Jointer

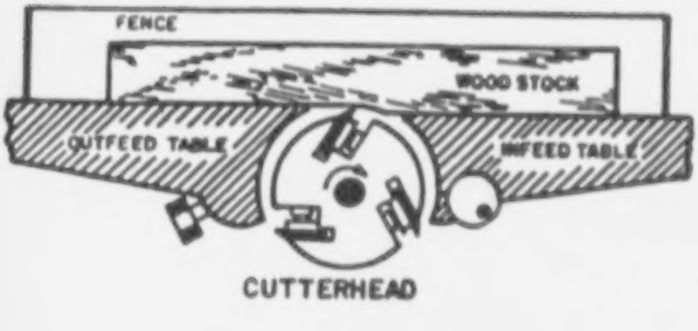

FENCE
WOOD STOCK
OUTFEED TABLE
INFEED TABLE
CUTTERHEAD

Figure 6. Jointer Operation

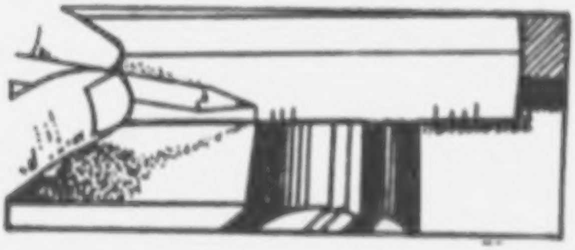


Figure 7. Check Blade Height of a 3-Blade Jointer With a Wooden Straight Edge

Table Saws

A tilt-arbor table saw is shown in figure 8. It is called a tilt arbor because when you tilt the blade for cutting bevels, you tilt the arbor only. The table, or bench as it is often called, remains level. On earlier types of table saws, the blade and arbor remained in a fixed position and the table was tilted. A tilted table is dangerous in many ways, especially when heavy stock must be pushed across it, so most modern bench saws are of the tilt-arbor type.

For ordinary ripping or crosscutting, the distance the saw blade should extend above the table top is 1/8 to 1/4 inch plus the thickness of the piece that is to be sawed. The vertical position of the saw blade is controlled by the depth-of-cut handwheel shown in figure 9. The angle of the saw blade is controlled by the tilt handwheel, usually located on the side of saw base. You must keep the guard covering the blades in place, except when its removal is absolutely necessary.

Band Saw

While the band saw is designed primarily for making curved cuts, it can also be used for straight cutting. Unlike the circular saws, the band saw is frequently used for freehand cutting. The band saw has two large wheels on which a continuous narrow saw blade or band turns, just as a belt is turned on pulleys. The lower wheel located just below the saw table is connected directly to the motor and serves as the drive wheel. The upper wheel, called the idler wheel, is located above the saw table.

The saw blade is guided and kept in line by two sets of blade guides as shown in figure 10. One fixed set is located below the table and one set, with a vertical sliding adjustment, is located above the table. The alignment of the blade is adjusted by a mechanism on the back side of the upper (idler) wheel. Tensioning of the blade (tightening and loosening) is provided by another adjustment located just behind the upper (idler) wheel as shown in figure 11.

The major components of a band saw are the wheels (drive and idler), table, guides, guide post, guards, and the blade or band.

The size of a band saw is determined by the diameter of its wheels. Common sizes of a band saw range in even numbers from 14 inches through 48 inches. The 14-inch size is the smallest practical band saw. With the exception of the capacity, all band saws are much alike in maintenance, operation, and ajustment. A typical band saw is illustrated in figure 12.

Jig Saw

A jig saw (also called a scroll saw), (see figure 13), performs many of the same functions as a band saw, but is usually capable of cutting more intricate curves. Instead of a flexible band type blade, the jig saw has a short, straight, rigid blade, such as the type shown in figure 14, which is moved up and down by a power mechanism.

The major components of a jig saw are the table, guide, blade, and motor. Other components include the base and the driving and tension mechanisms.

One advantage of the jig saw over the band saw, is that it can be used to cut internal curves, as well as external curves on thin flat stock. To cut internal curves, you can insert the blade through a small hole bored in the material as shown in figure 15. Push the material into the saw blade and make the cut. You can remove the blade from the machine and remove the material from around the table.

Maintenance

The most important factors in the care and maintenance of power saws are the proper lubrication of all moving parts and the proper conditioning of the saw blade. A saw blade that is dull or has teeth incorrectly shaped or improperly set will "labor" in the wood. This places an excessive strain on the saw's driving mechanism.

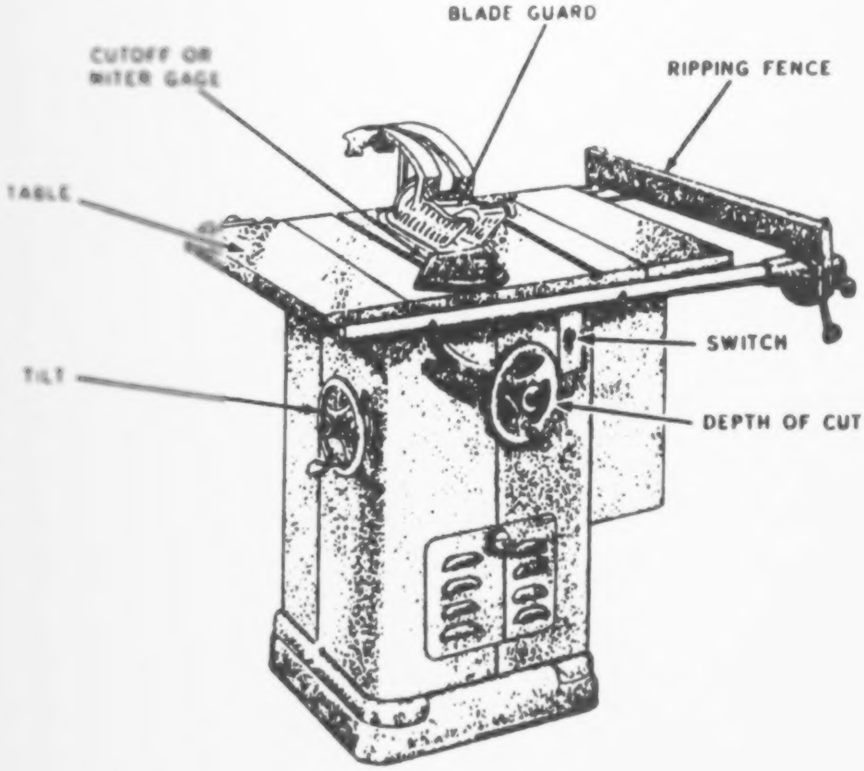


Figure 8. Table Saw

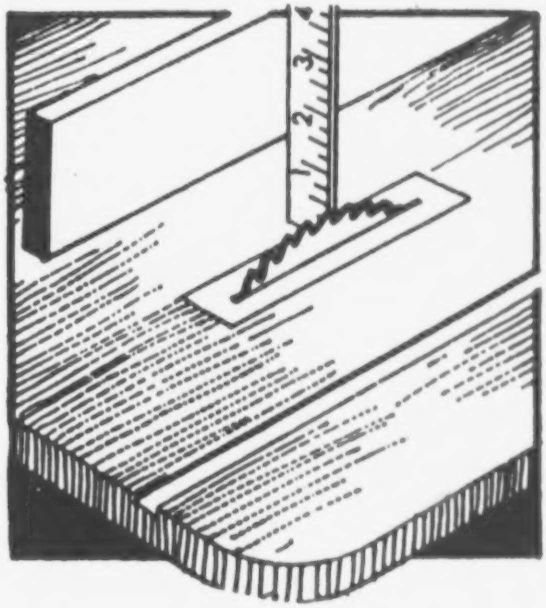


Figure 9. Checking Blade Height on a Table Saw

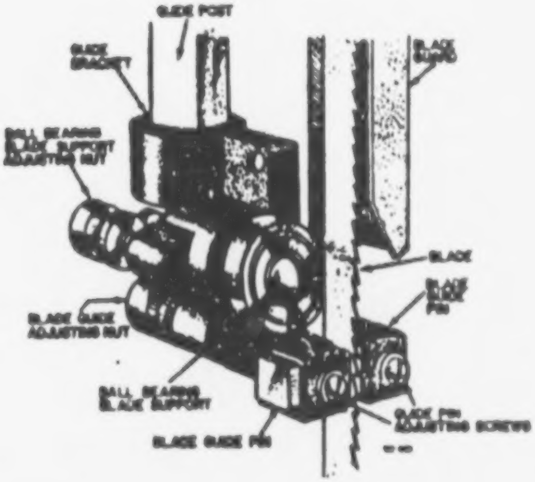

GUIDE POST
GUIDE BRACKET
BLADE GUARD
BALL BEARING BLADE SUPPORT ADJUSTING NUT
BLADE
BLADE GUIDE PIN
BLADE GUIDE ADJUSTING NUT
BALL BEARING BLADE SUPPORT
BLADE GUIDE PIN
GUIDE PIN ADJUSTING SCREWS

Figure 10. Parts of a Band Saw Upper Blade Guide Assembly

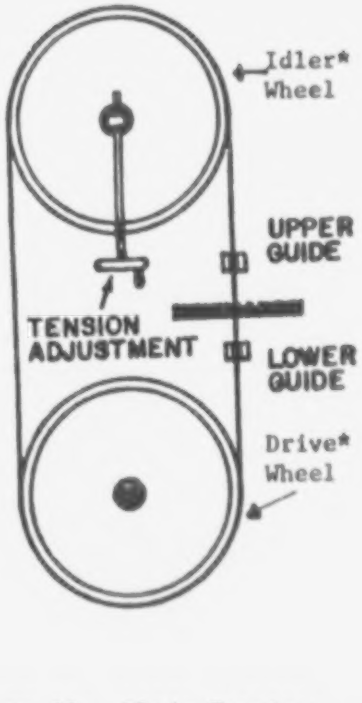

Idler*
Wheel
UPPER
GUIDE
TENSION
ADJUSTMENT
LOWER
GUIDE
Drive*
Wheel

Figure 11. Blade Tension-Adjustment Handle on a Band Saw

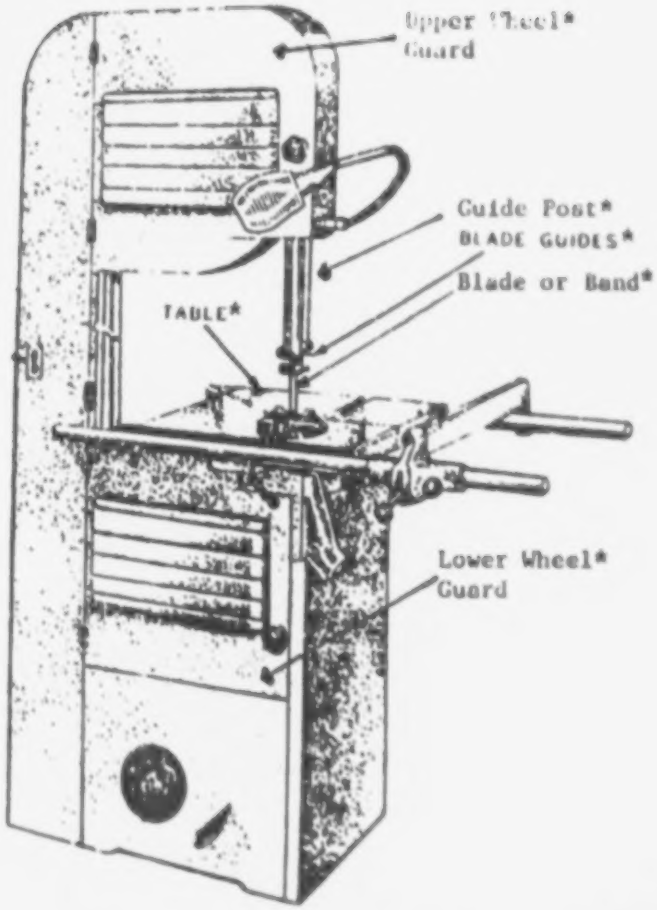

Upper Wheel*
Guard
Guide Post*
BLADE GUIDES*
Blade or Band*
TABLE*
Lower Wheel*
Guard

Figure 12. Parts of Band Saw

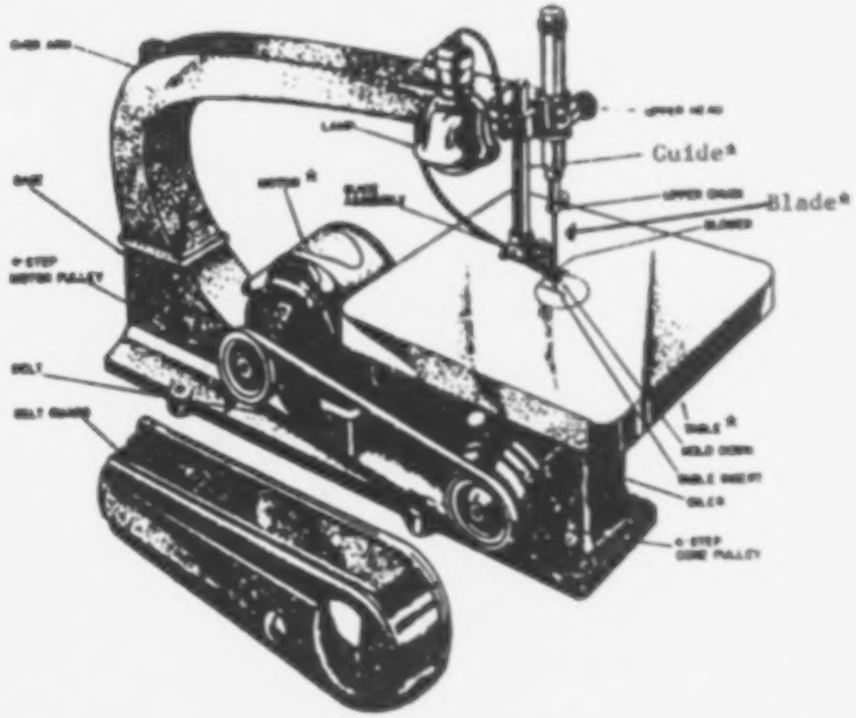

OVER ARM
UPPER HEAD
LAMP
Guide*
MOTOR *
BLADE ASSEMBLY
UPPER GUIDE
Blade*
BLOWER
BASE
4-STEP MOTOR PULLEY
BELT
BELT GUARD
TABLE *
HOLD DOWN
TABLE INSERT
OILER
4-STEP CONE PULLEY

Figure 13. Jig Saw

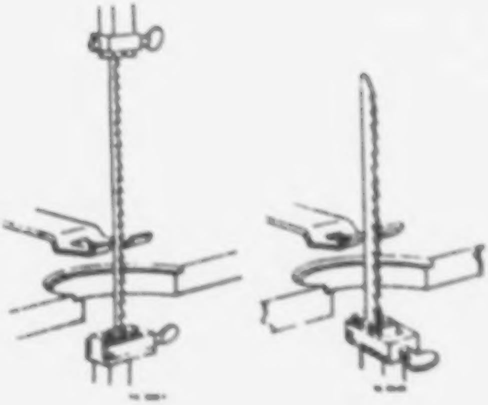


Figure 14. Jig Saw Blade Installation

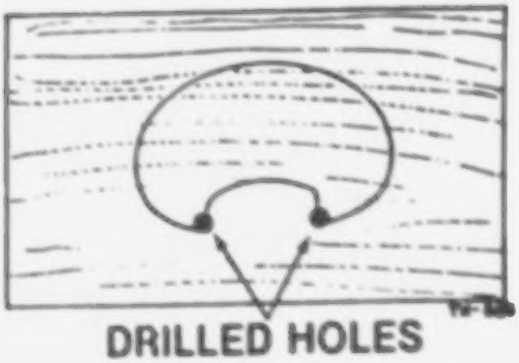

DRILLED HOLES

Figure 15. Layout for Inside Cuts With Jig Saw

Saber Saw

A saber saw, as shown in figure 16, is used primarily for light work and may be used to make straight cuts or bevel cuts. Different types of blades are available with teeth ranging from 6 to 12 teeth per inch for cutting wood. The saber saw blade cuts on the upward stroke and splintering of the material does occur on the side being cut, so you must consider this factor before cutting. There are many different types of saber saws and each varies on blade installation and saw design, so you should refer to the manufacturers' manual for information on changing saw blades.

To use a saber saw, you must make certain that the saw is grounded and you should wear eye protection when cutting. The toe or front of the saw base is placed firmly on the material before starting the cut. Turn on the saw before the blade comes into contact with the material and start the cut by moving the saw forward slowly, holding the base of the saw flat and firmly upon the material that you are cutting. You can cut openings in material by first drilling a starting (pilot) hole in the piece of material that is to be discarded, or make a "PLUNGE CUT"; this is performed by placing the front end of the saber saw base down on the work, turning on the motor and then slowly lowering the moving blade down into the cut. When plunge cutting, as shown in figure 16-a, do not attempt to cut curves that are so sharp your blade becomes twisted and breaks.

The major components of a saber saw are the handle, base, blade, and guide knob. Other components include the housing, blade screw, and cord strain reliever.

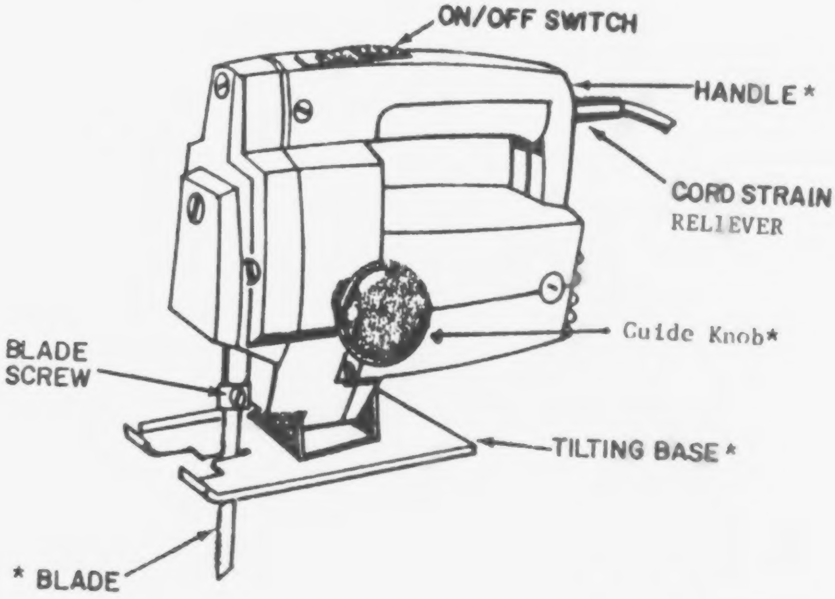


Figure 16. Parts of a Saber Saw

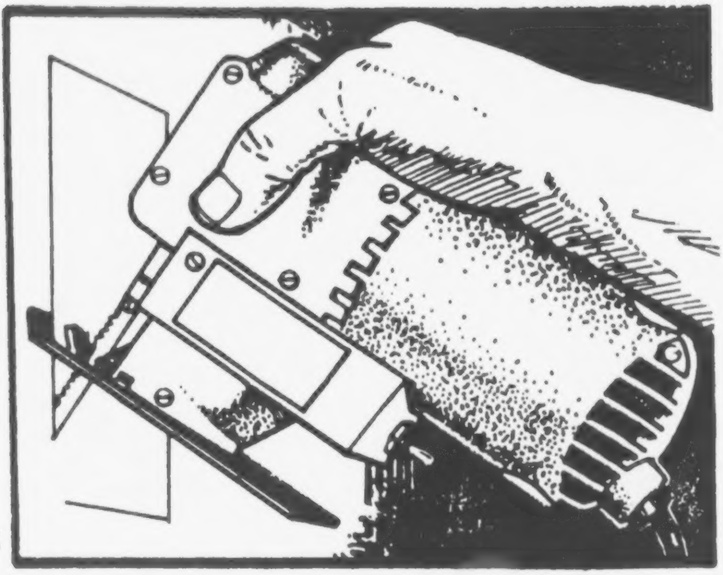


Figure 16-a. Starting A Pocket (Plunge) Cut

Drill Press

The drill press shown in figure 17 was originally developed for metal work. However, many woodworking and carpentry shops do have a drill press. The main parts of the machine are a polished steel tubular column that is fastened to a machined cast-iron base, a table for holding the work, and a head assembly located near the top of the column. The head assembly contains the drill spindle and the motor. The motor drives the spindle through a step-pulley and a belt arrangement, which allows the operator to select any one of four different speeds. The head assembly also includes belt guards, a feed lever, an adjustable-depth scale, and the chuck on the end of the spindle. You can position the entire head assembly and lock it in place anywhere along the upper end of the column. The table can also be positioned at any desired height on the column, or it can be removed, or be turned to one side to allow the machine base to be used as a working surface.

The major components of a drill press are the column, table, base or lower table, and the head assembly.

Attachments are available for drill presses. Besides drilling holes, the drill press can be equipped with standard routing bits and can be used for inlay or routing work. A shaper head can also be adapted to some drill presses for light shaping operations. When the drill press is used for either routing or shaping, the belt should be positioned on the step-pulleys to obtain the maximum spindle speed.

Another drill press attachment is the hollow-chisel mortising attachment, shown in figure 18. The attachment consists primarily of a yoke that is attached to the head assembly of the drill press. The hollow chisel is inserted into the yoke. The bit is placed into the hollow chisel and into the chuck of the drill press. When using a drill press as a mortiser, position the belt on the step-pulleys to obtain the minimum spindle speed.

When the drill press is used for straight boring or drilling holes in wood, a power-driven drill always uses a twist drill bit. You should never attempt to use an auger bit in a drill press. The most important care and maintenance factors for a drill press are proper lubrication of moving parts and the use of properly conditioned and sharpened twist drill bits.

Mortiser

The cutting mechanism on a hollow-chisel mortising machine is a boring bit, which is encased in a square, hollow steel chisel as shown in figure 19. The bit is similar to a standard wood auger bit from which the starting screw has been removed from the tip of the blade. A slot machined into one side of the square chisel allows the cutting waste to discharge as the bit rotates inside the chisel. As the mechanism presses into the wood, the bit takes out most of the waste while the chisel cuts the sides of the mortise square.

The major components of a mortiser are the chisel, bit, table, foot control, fence, head assembly, and adjusting wheels.

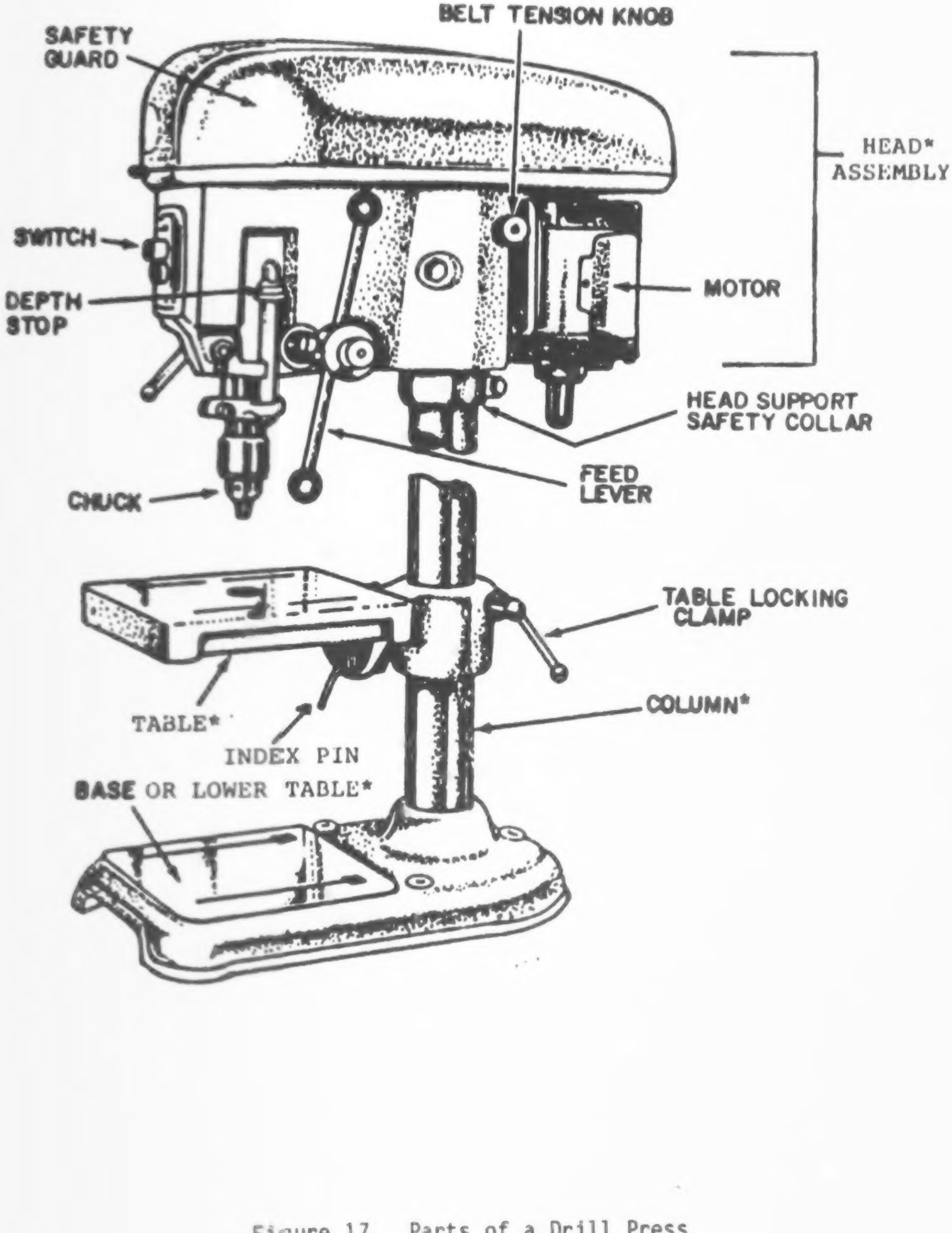

BELT TENSION KNOB
SAFETY GUARD
HEAD* ASSEMBLY
SWITCH
DEPTH STOP
MOTOR
HEAD SUPPORT SAFETY COLLAR
FEED LEVER
CHUCK
TABLE LOCKING CLAMP
COLUMN*
TABLE*
INDEX PIN
BASE OR LOWER TABLE*

Figure 17. Parts of a Drill Press

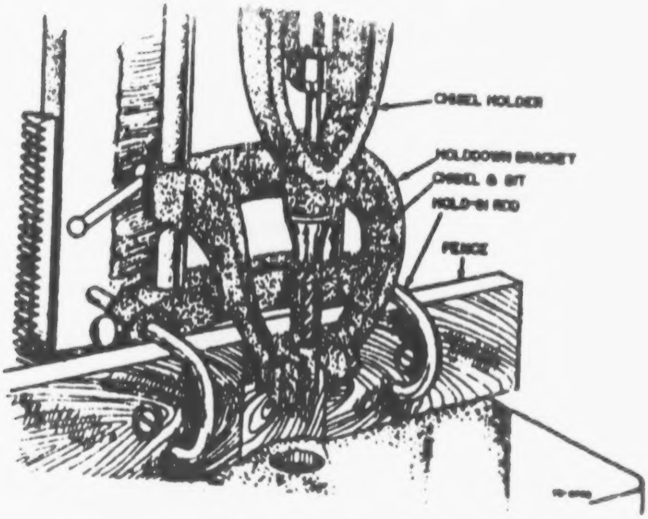

CHISEL HOLDER
HOLDDOWN BRACKET
CHISEL & BIT
HOLD-IN ROD
FENCE

Figure 18. A Mortising Attachment Fastened to a Drill Press

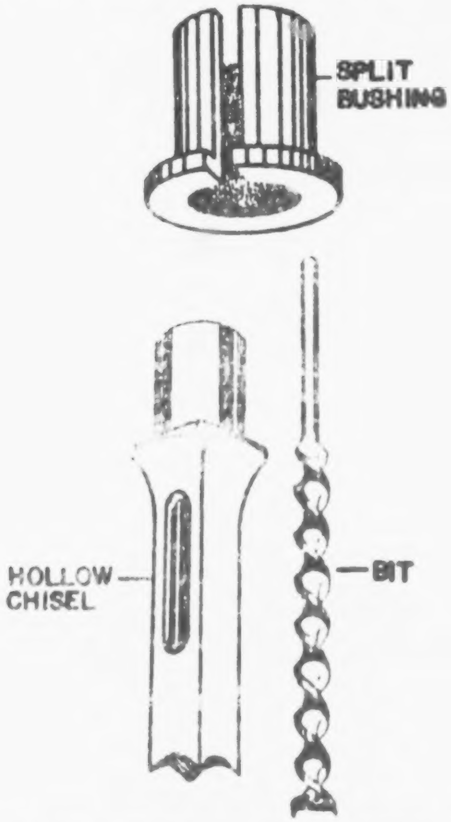

SPLIT BUSHING
HOLLOW CHISEL
BIT

Figure 19. Mortiser Hollow Steel Chisel and Bit

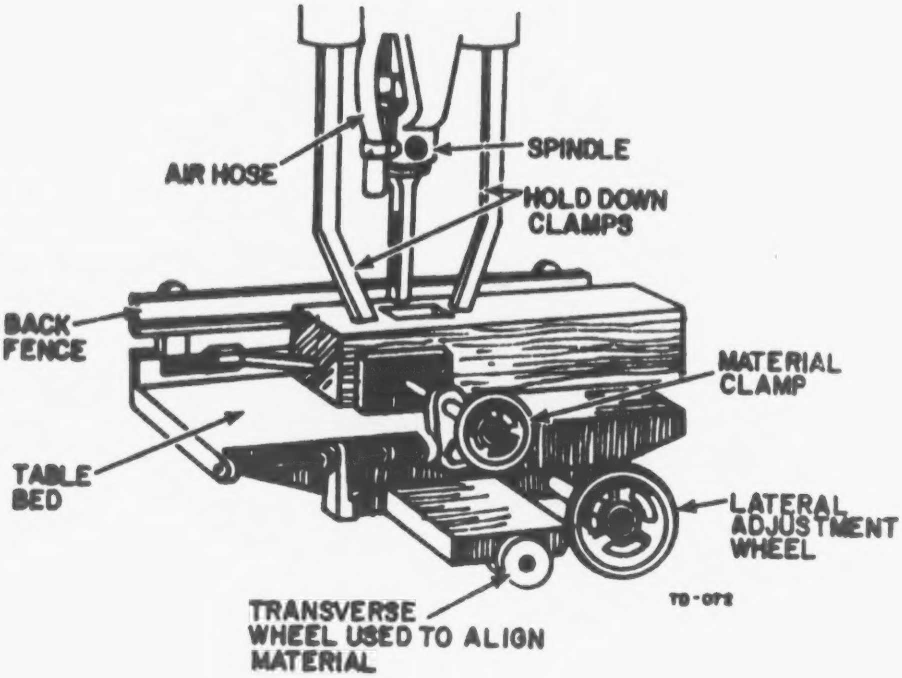

AIR HOSE
SPINDLE
HOLD DOWN CLAMPS
BACK FENCE
MATERIAL CLAMP
TABLE BED
LATERAL ADJUSTMENT WHEEL
TRANSVERSE WHEEL USED TO ALIGN MATERIAL
TD-072

Figure 20. Mortising Machine

Mortising Machines

Mortising machines are constructed on a heavy cast frame that rests on the floor. The power unit and the hollow-chisel mechanism are located at eye level near the top of the machine. A table and fence to support the material being worked, are at a convenient working height on the machine frame (see Figure 20). Once the height of the table has been set, you can move the table back and forth laterally with a handwheel located on the front of the machine. A foot-operated pedal lowers and raises the hollow-chisel mechanism during the cutting operation. Adjusting the height of the table controls the depth of the cut on a mortiser.

Insert the shank of the bit up and through the hollow chisel and into the spindle. Turn the flat side on the shank of the bit so that the spindle setscrew mates properly to hold the bit securely. Before tightening the set screw, adjust the bit either upward or downward through the hollow chisel to a point where the cutting lips on the bit project at least 1/16 inch, preferrably 1/8 inch, below the cutting edges of the chisel. You need this clearance to prevent excessive heat buildup during the cutting operation.

Shaper

The shaper (shown in figure 21) is designed primarily for cutting ornamental edges. The main parts of the shaper are a table which has a removable throat at its center through which a spindle projects, a supporting floor base, adjustable guards and fences, and an assortment of collars and cutting knives. The spindle projects vertically through the throat and is usually belt-driven. The speed on floor model shapers is quite high. The speed of the spindle on medium size shaper varies from 5,000 to 10,000 rpm.

Two basic types of cutters are used on shapers. One is a three-wing, solid-collar type, and the other is a flat-knife, grooved-collar assembly. A three-wing cutter fits over the shaper spindle. Flat-knife cutters are assembled in matched pairs between grooved collars that fit over the spindle.

A hexagonal spindle nut holds the cutters in place on the spindle. A second nut is tightened against the spindle nut and serves as a safety lock. Be very careful when you are placing knives in the grooved collars to avoid unequal pressures or projection of the cutting edges. If the collars exert more pressure on one knife than the other, the knives can work loose when the machine is started or running. If one knife extends even slightly farther beyond the other, the assembly will be unbalanced and vibrate. Keep all cutters and knives sharp to insure quality work.

Maintenance

The two most important factors in the care and maintenance of a jointer, surfacer, or shaper is the proper lubrication of all moving parts and the proper sharpening and adjustment of the knives and cutters. Dull knives and cutters deteriorate the machinery by causing the machinery to "labor" and to "chatter" or vibrate.

Portable Power Saw

Portable electric power saws reduce the amount of manual labor required to complete a project. When using power saws, concentrate on what you're doing when operating the tool and follow the manufacturer's recommended operating instructions. Make all adjustments to the tool prior to plugging in the cord. Use all guards when possible, and wear approved eye protection.

The tool, shown in figure 22, is probably the most often used of portable power tools. A portable circular saw is used primarily for rough work, such as in the erection of building framework or wooden concrete form erection. A portable circular saw size, is determined by the diameter of the blade, with blade sizes ranging from 4 1/4 to 12 inches. The portable saw can be used for cabinet construction when normal shop equipment is not available. Normally, you will find a 7 1/4 or 7 1/2 inch saw in most carpentry sections. Either of these saws is capable of cutting 2-inch depths by raising or lowering the motor on the saw's base. Make sure that you tighten the depth adjustment knob before using the tool. The base of a circular saw can be tilted using the tilt adjustment, allowing you to cut bevels as shown in figure 23.

BEST COPY AVAILABLE

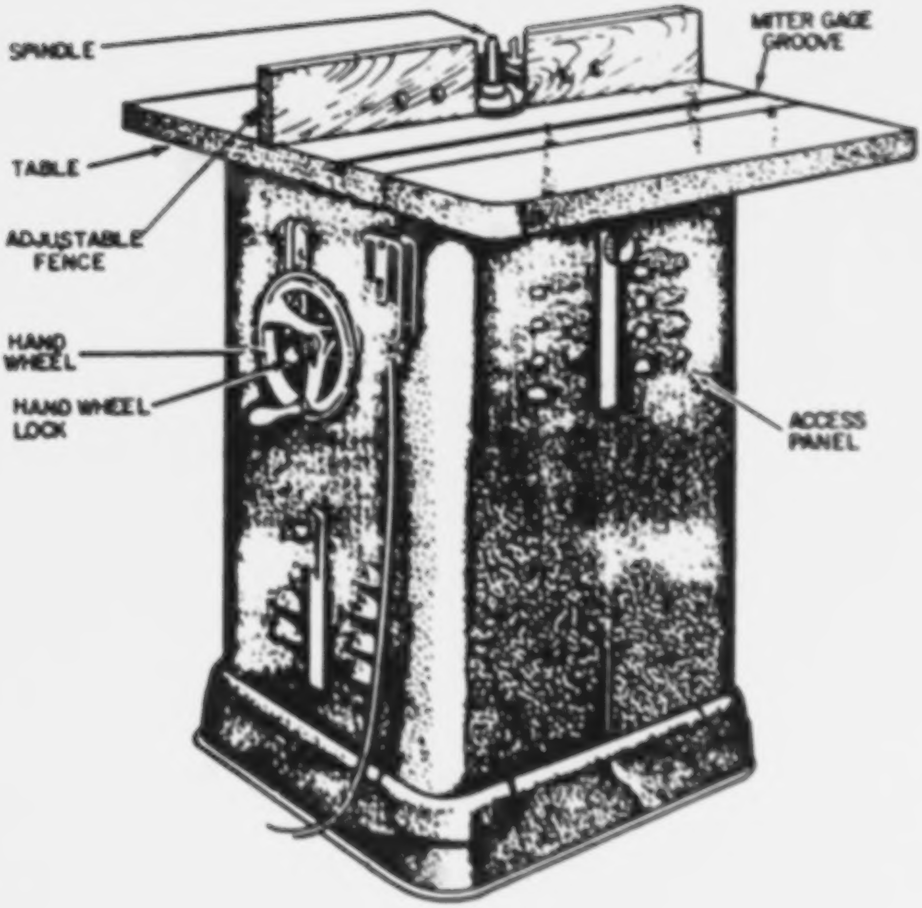

SPINDLE
MITER GAGE GROOVE
TABLE
ADJUSTABLE FENCE
HAND WHEEL
HAND WHEEL LOCK
ACCESS PANEL

Figure 21. Parts of a Shaper

When ripping, as shown in figure 24, you should use the rip guide or rip fence to obtain straight cuts. Always be sure that when ripping or crosscutting, to adjust the saws depth of cut to the thickness of the material being cut plus 1/8 inch. This will allow the saw blade to cut all the way through the material and could help prevent a serious injury.

Material that is to be cut with a circular saw, must be supported or fastened, so that it will not slip or move during the cutting operation. You should start the saw by placing the front portion of the saw (bas) on the material that is to be cut and by gripping firmly the handle and knob located on the front of the saw, then press the trigger switch. (NOTE: Be sure to keep the saw blade a short distance back from the edge of the material when starting the saw to prevent the saw from "kicking-back" on the edge of the material.)

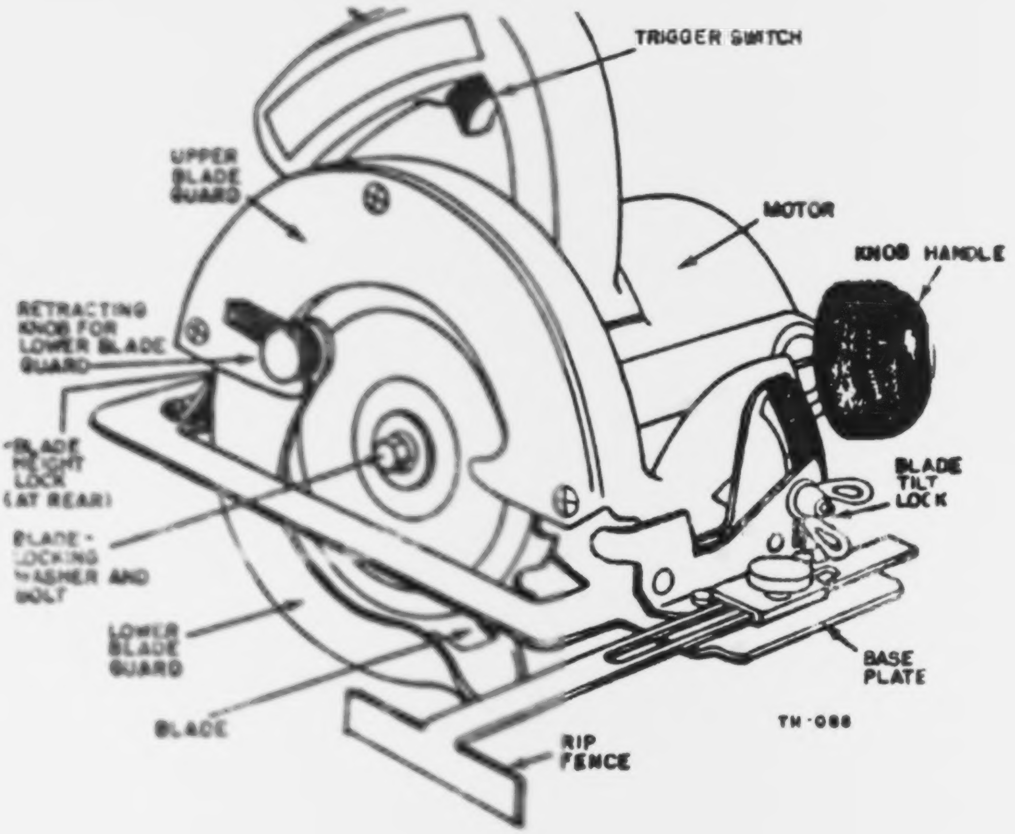

TRIGGER SWITCH
UPPER BLADE GUARD
MOTOR
KNOB HANDLE
RETRACTING KNOB FOR LOWER BLADE GUARD
BLADE HEIGHT LOCK (AT REAR)
BLADE TILT LOCK
BLADE-LOCKING WASHER AND BOLT
LOWER BLADE GUARD
BASE PLATE
BLADE
TH-088
RIP FENCE

Fig. 22. Parts of a Portable Circular Saw

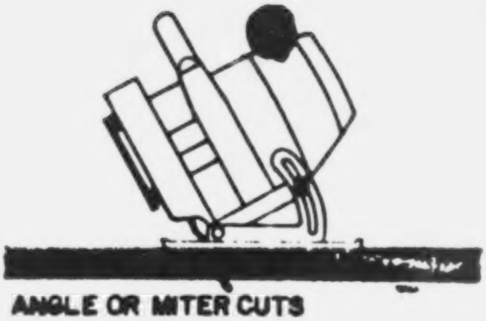


Figure 23. Using a Portable Circular Saw to Cut Angles or Miters

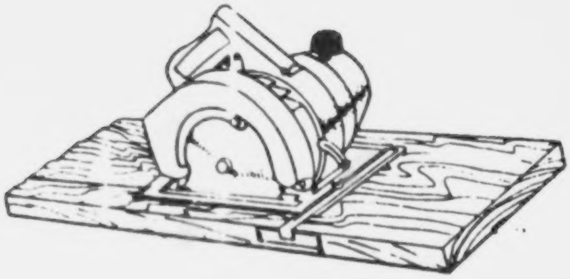


Figure 24. Using a Portable Circular Saw to "Rip" Material

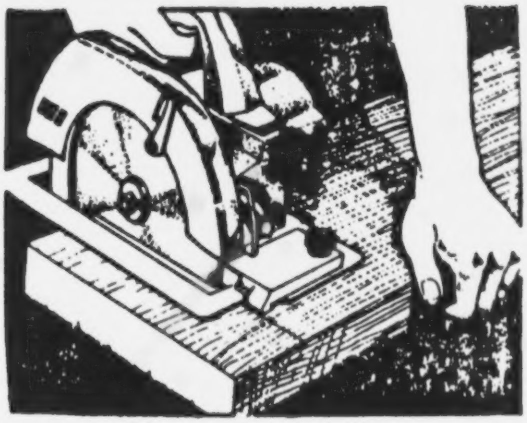


Figure 25. Crosscutting With a Portable Circular Saw

When pressing the trigger switch, most circular saws tend to jerk, but then operate smoothly as the blade speed increases. This statement is not intended to frighten you, but since this does happen, it will help prepare you for your first encounter with a circular saw. Upon pressing the trigger switch (figure 25), allow the saw motor to reach full speed, then force the saw slowly into the stock. If you are cutting off a long piece of material, the piece that is being cut off must be supported by a helper. The helper must support the piece and prevent it from moving or dropping, which closes the cut and will bind the saw blade.

SUMMARY

Power equipment is a valuable asset to the craftsman in the construction of cabinets and in other carpentry work when operated by trained personnel following all outlined safety procedures.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-II-2

CABINET ASSEMBLY

OBJECTIVE

a. Given procedures, tools, previously cut lumber, cabinet plan, materials and working as a member of a team, assemble a cabinet with no more than three instructor assists. Cabinet joints must be tight, square and within ± 1/16" of true.

INTRODUCTION

You have learned to use power tools to cut your materials for your cabinet. You have learned the basic types of cabinet construction. Now you will assembly the cabinet you have cut.

INSTRUCTION

Read the following information in the text, Modern Woodworking:

Furniture and Cabinet Work, Unit 18, pages 281-304.

INFORMATION

Cabinet Assembly

A good cabinet builder is the artist of the carpentry career field. The cabinet builder must have patience and must work to exact measurements. Although the Air Force does not ordinarily build furniture, there will be times when you must build cabinets, bins, or bookcases. This exercise will introduce you to the basics you will need to do the job.

Before assemblying your cabinet, assemble the cabinet dry (without glue or nails). Check to see that all joints are clean and fit properly. Ensure that your cabinet is square. If your cutting was precisely accomplished in compliance with your cabinet plan, you should have no problem. If you do see that you have problems, now is the time to ask for assistance in making adjustments.

The cabinet you are building will be assembled with nails and glue. You will need clamps to hold your cabinet together while the glue sets. If you are using bar or pipe clamps, put scrap stock between the clamps and the cabinet.

When assembling a cabinet, the glue holds the cabinet together. DO NOT OVERNAIL. Good construction practice in building a bookcase or cabinet would be to nail into the frame under the shelves. DO NOT NAIL INTO THE TOP OF YOUR SHELVES OR CABINET. This shows a lack of craftsmanship or a lack of pride in your work. You will be using brads and finish nails as prescribed by your cabinet plan. The nails must be set. When nailing, do not drive your nails home (all the way in) as you would in framing a house. Nail almost to the surface of your cabinet and then use a nail set to finish nailing and setting the nail. This will prevent hammer damage (DIMPLING) to your cabinet. When filling your nail hole, use care not to get putty on any more of the cabinet surface than necessary. Should you decide to stain the cabinet, the stain will not work properly anywhere it comes in contact with the putty.

At times your cabinet plan might call for assembling your cabinet with dowel joints or mortise and tenon joints. To enable you to construct these joints, we are now going to teach you how to make dowel joints with the drill press and how to use the mortise machine for constructing mortise and tenon joints.

Types of Cabinet Construction

Before you start constructing a cabinet, become familiar with all of the building details and prepare a bill of materials. As you study your drawing, you will find that the article to be constructed can be classified as belonging to one of three forms of cabinet construction - frame, stool or box.

Regardless of the cabinets you make, use one of these three general forms or a combination of them. Why? Because these three forms serve as the basis for all cabinet construction and can be adapted to fit any design. However, you must use special methods where you desire intricate shapes.

Frame Construction

Frame construction consists of a grooved frame and a panel that fits into the groove. The framework adds strength, because the grain of the wood runs lengthwise in both length and width. Frame construction is highly desirable, because it overcomes shrinkage and expansion and is very strong. Figure 2-1 illustrates a simple type of frame construction. Various joints can be used to fasten the frame together.

Stool Construction

As shown in figure 2-2, stool construction may be regarded as four frames assembled together to form a rectangle or square. It is used for tables, chairs, stands, and many types of cabinets. Mortise and tenon joints and dowel joints work well in stool construction. When fitting this type of construction with a top (for example, a table top), do not secure the top with glue, because wood shrinks across its width and the top must be able to give with the shrinking and expanding process. Figure 2-3 illustrates how a table top is secured in stool construction. If the rails and top shrink or expand, then the top can move without splitting.

Box Construction

Box construction is used for articles made from solid wood, such as chests of drawers, cupboards, and bookcases. Any item built without a framework comes under the heading box construction. Figure 2-4 illustrates one type of box construction. When using the box construction method, use rabbet, butt, miter, or dovetail joints.

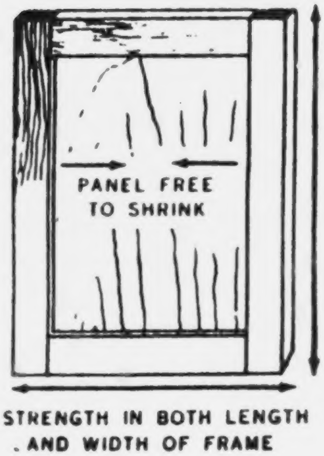

PANEL FREE
TO SHRINK
STRENGTH IN BOTH LENGTH
AND WIDTH OF FRAME

Figure 2-1. Frame Construction

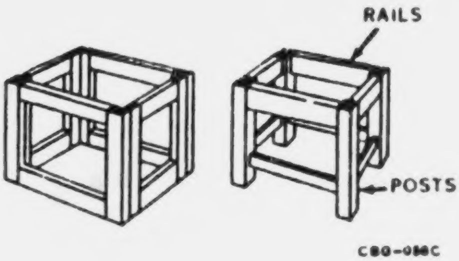

RAILS
POSTS
C80-080C

Figure 2-2. Stool-Type Construction

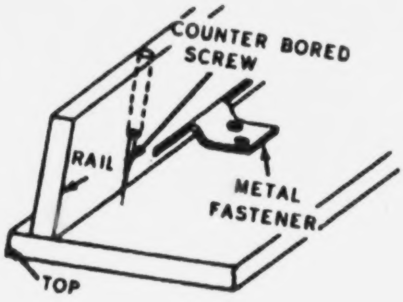

COUNTER BORED
SCREW
RAIL
METAL
FASTENER
TOP

Figure 2-3. Securing Tops

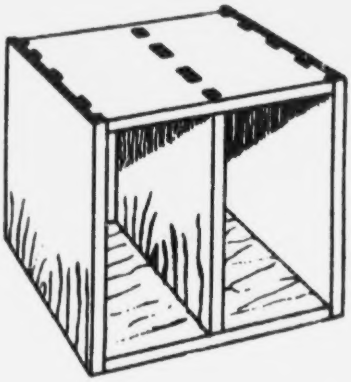


Figure 2-4. Box Construction

Cabinet Doors

Doors used on cabinets are classified as rabbeted, flush and paneled.

Rabbet doors are commonly found on kitchen cabinets. A rabbeted door is constructed by cutting the door material 3/4" larger than the opening, across the length and width, so that the joint will not show. The edges that bear surface at the top and sides of the cabinet receive a 3/8" rabbet. Figure 2-5 displays a door with only 3 sides rabbeted; other styles require rabbeting on all four sides. Door material commonly consists of 3/4" plywood but may be constructed of common lumber.

Flush doors for most cabinets are solid and are cut to allow a 1/6" clearance on all sides. They are installed with their face flush with the cabinet facing and care should be taken during installation to ensure all hinges are properly aligned.

Paneled doors are commonly a surface-mounted door, but may be rabbeted. Construction instruction includes rails, stiles, and a panel. The rails and stiles are assembled with mortise and tenon joints, and the panel is installed in a groove. Figure 2-6.

Household Cabinets

Construction of residential cabinets may include any of the above types of doors. The cabinets are commonly constructed with 3/4" plywood sides, facing consisting of stiles, rails and mullions, a hanging strip to secure the cabinet to the wall, and a 5/8" or 3/4" laminate covered top. Base (floor) cabinets should include a toe space at the bottom of the cabinet. Figure 2-7 outlines the basic design used in floor cabinet construction.

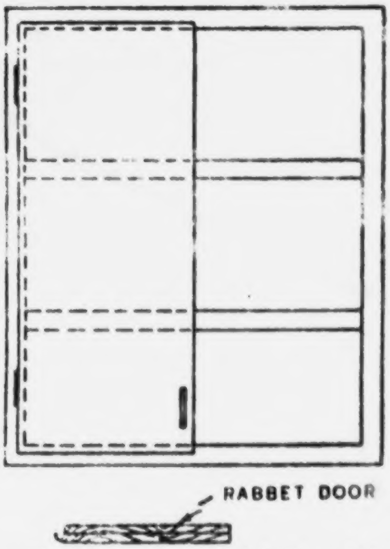


Figure 2-5. Cabinet with One Rabbeted Door in Place

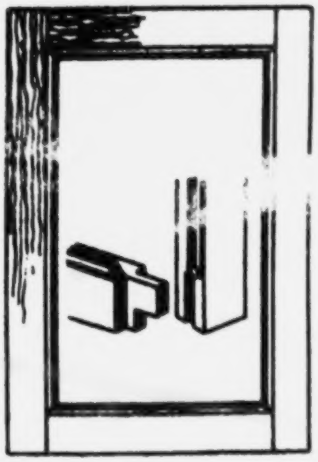


Figure 2-6. Molding on Panel Door

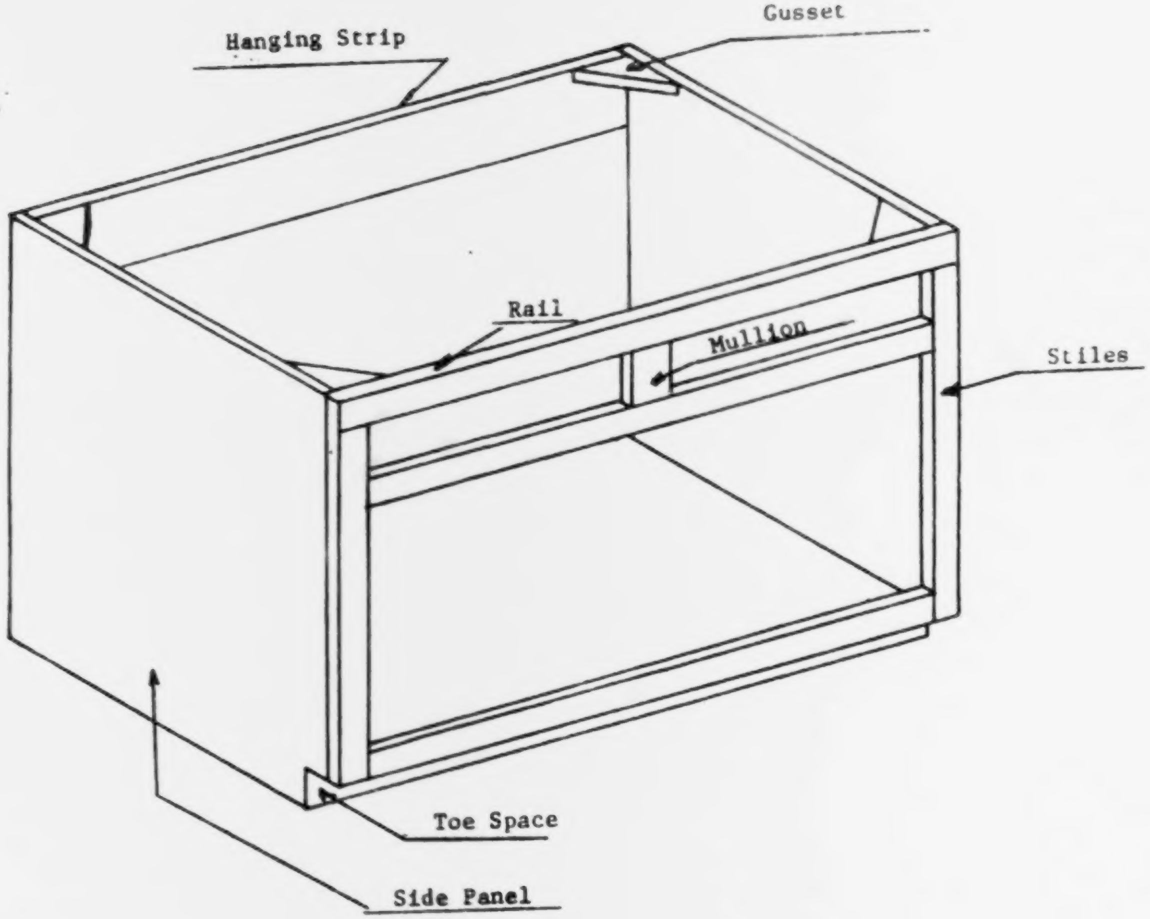

Hanging Strip
Gusset
Rail
Mullion
Stiles
Toe Space
Side Panel

Figure 2-7. Base Cabinet

SUMMARY

Cabinet assembly is a very delicate operation. You must ensure that all of the cabinet components are cut to the correct dimensions before permanently assembling the cabinet. Dry assembly must take place before any gluing or nailing is accomplished. Ensure that all the joints fit tightly and the cabinet is within specifications for square. Taking the extra time and effort to ensure that everything fits before final assembly will help in building a product that you will be proud of and may save time that you would have to spend cutting new cabinet components.

SURFACE SANDING

OBJECTIVE

a. Given procedures, an assembled cabinet, power tools, materials and working as a member of a team sand a cabinet with no more than two instructor assists. Surfaces must be smooth and free of scratches and splinters.

INTRODUCTION

Now that you have assembled your cabinet, you are ready to sand it. In Block I, you learned to sand by hand. Now you will learn to use machines to sand. We will learn to operate the stationary-disc/belt sander, the portable belt sander, and the vibrating sander. You will learn which sander to use for specific sanding operations. You will use the sanding machines to sand your cabinet.

INFORMATION

A disc sander is a revolving, circular metal plate to which a sheet of abrasive paper has been glued or clamped. Stationary disc sanders are equipped with an adjustable table to support the work. The table can be tilted upward or downward for sanding beveled edges, angles, or tapers. Figure 3-1 shows a combination disc and belt sander.

Finishing Sanders (Portable)

There are two different types of portable finishing sanders: they are either orbital or oscillating (vibrating). The purpose of either of these two types of sanders is to remove small amounts of wood or the final sanding of a project. Figure 3-2 shows the parts of an orbital sander concerned with you operating the tool. When using an orbital sander, the pad revolves in a circular pattern. On an oscillating sander, the pad moves forward and backward in a straight line. Orbital sanders cut faster than the oscillating sanders and are used as general purpose sanders. Oscillating sanders are used when a fine finish is desired upon a project.

The major components of a vibrating sander are the housing, handle, paper clamp, and pad.

The finishing sander should be started when it is off the work and moved back and forth in a pattern following the grain of the material being sanded. You must avoid the use of excessive pressure to prevent slowing down and overheating of the sander motor. Excessive pressure also forces the sandpaper to wear faster than normal and the sand grit cuts the wood's surface, leaving scratches that will show after finishing. A finishing sander may be used with either one or both hands.

Abrasive paper or sandpaper is fastened over the pad on the sander to paper clamps located at the front and rear ends of a sander. Sander pads usually are designed so that a 9" by 11" sheet of sandpaper can equally be divided into thirds of a sheet. There are four basic types of abrasive papers: flint, garnet, silicon carbide, and aluminum oxide. Pages could be written describing these sandpaper's grading systems, but for easy identification and selection, if you see a set of low numbers such as 4, 16, 20, 40, or 50 on the back of sandpaper, the sanding surface usually will be coarse. High numbers such as 90, 400 or 600 indicate a very fine grit on the abrasive side of the paper. Course grades of abrasive paper are used to remove marks or rough edges left during the cutting and finishing of wood materials. Finishing grades of abrasive papers are used for final sanding, when removing small amounts of material or by protective coating for cutting down and rubbing between finish coats.

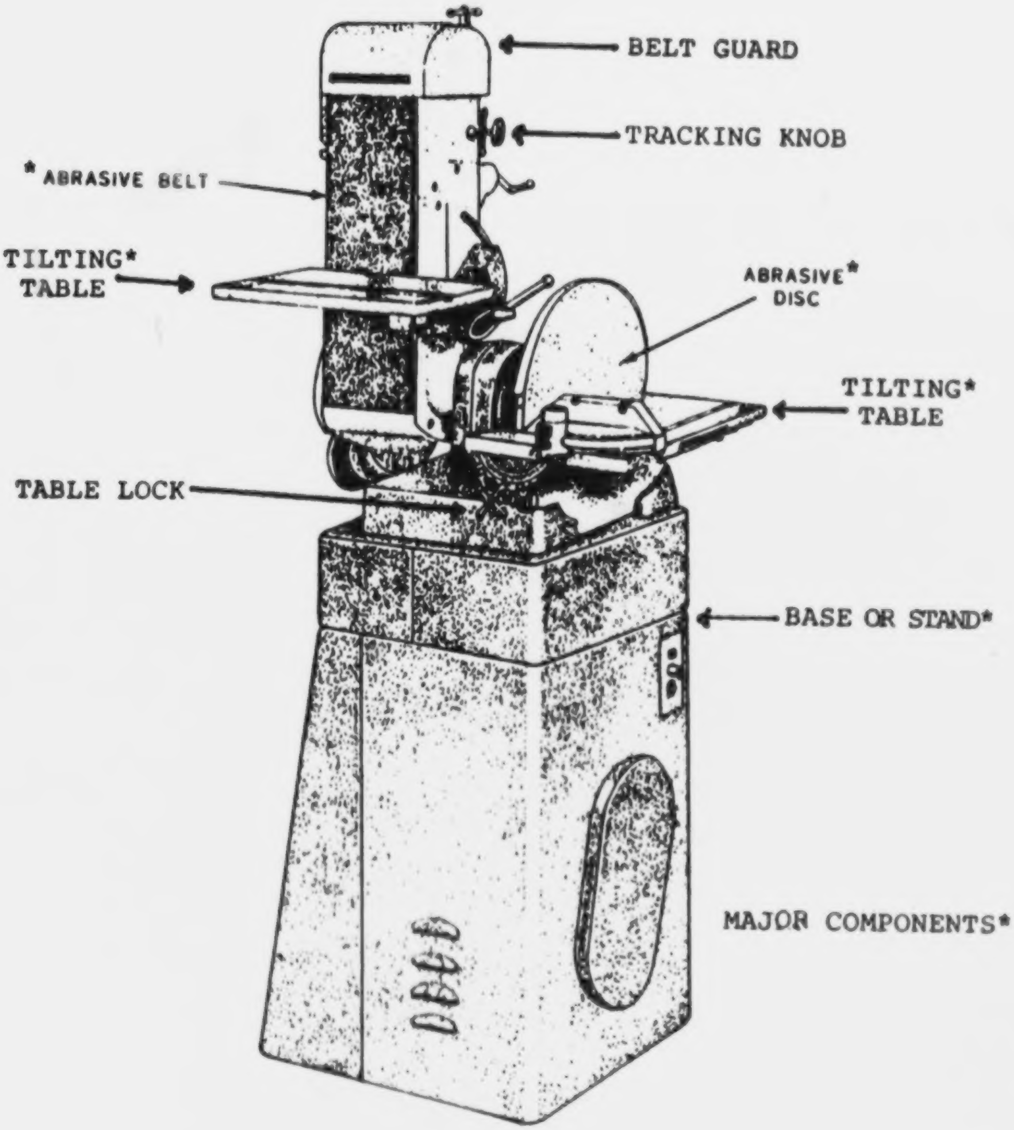

BELT GUARD
TRACKING KNOB
*ABRASIVE BELT
TILTING* TABLE
ABRASIVE* DISC
TILTING* TABLE
TABLE LOCK
BASE OR STAND*
MAJOR COMPONENTS*

Figure 3-1. Combination Disc and Belt Sanding Machine

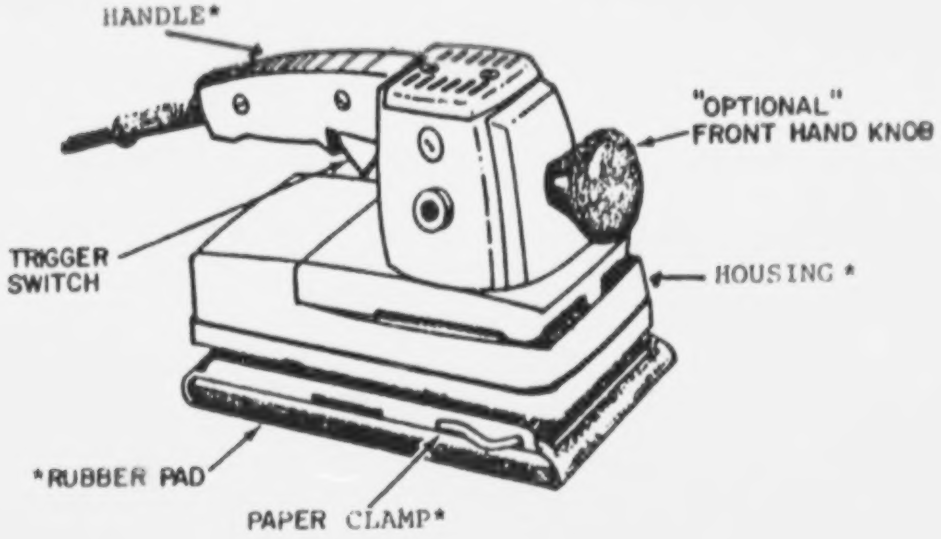


Figure 3-2. Parts of a Finishing Sander

Belt Sanders (Portable)

The portable belt sander shown in figure 3-3 is designed for the sanding of flat surfaces such as rough-cut wood, stairs, or furniture. The portable belt sander consists of two pulleys turning the desired grit of sanding belt over a padded metal plate on the bottom of the power tools. The portable belt sander will range from 3 to 4 inches in width and belts that vary in length, depending upon the different type of machines. (NOTE: Only one length of belt may be used upon a specific type of belt sander, such as 24-, 26-, or 28-inch lengths.) The sander has two handles that allow the use of both hands and aids you in controlling the machine.

The major components of a belt sander are the handles (D-handle and front handle), dust bag, tracking knob, and belt.

Material that is to be sanded with a portable belt sander must be clamped or secured to prevent it from sliding out from under your sander. Once the material is secured, start the sander, and allow the sander's motor to reach its maximum speed. The sander should be lowered onto the material, tilted slightly to the rear. If the sander is lowered from end first, the front pulley will "dig" the sanding belt into the material. The rear pulley is the power source for turning the belt and the front pulley is spring loaded. You must use the main (rear) handle to control the sander and the front handle to control the direction of the sander as you move it slowly over the work as shown in figure 3-4. The operator of the sander is following a pattern that matches the grain of the wood. Your sander was designed to serve as the proper weight placed upon the sanding belt. Extra pressure results in uneven surfaces, clogged belts, and extra wear on the sander's motor.

To replace a sanding belt, unplug the sander and clean off the excess dust, then lay the machine on its left side. The front pulley is retracted by releasing the lever located between the belt and two pulleys. There are many

The new belt is placed upon the pulleys by first examining the inside of the belt to determine its turning direction. There will be an arrow printed on the inside of the belt to indicate the belt's turning direction. After placing the belts on the pulleys, the front pulley lever clamp is released so that tension is again applied to the belt. Your next step is to support the sander on the heel of its base as shown in figure 3-5 and begin tracking the sanding belt. When tracking the sanding belt, you must wear eye protection! Turn on the sander and adjust the tracking knob located on the left side of the sander so that when the belt turns, it is so centered on the pulleys of the sander. When tracking a sanding belt, you should turn the tracking knob slowly to prevent the moving belt from coming into contact with the body of the sander. Once the belt is tracked, you can begin sanding.

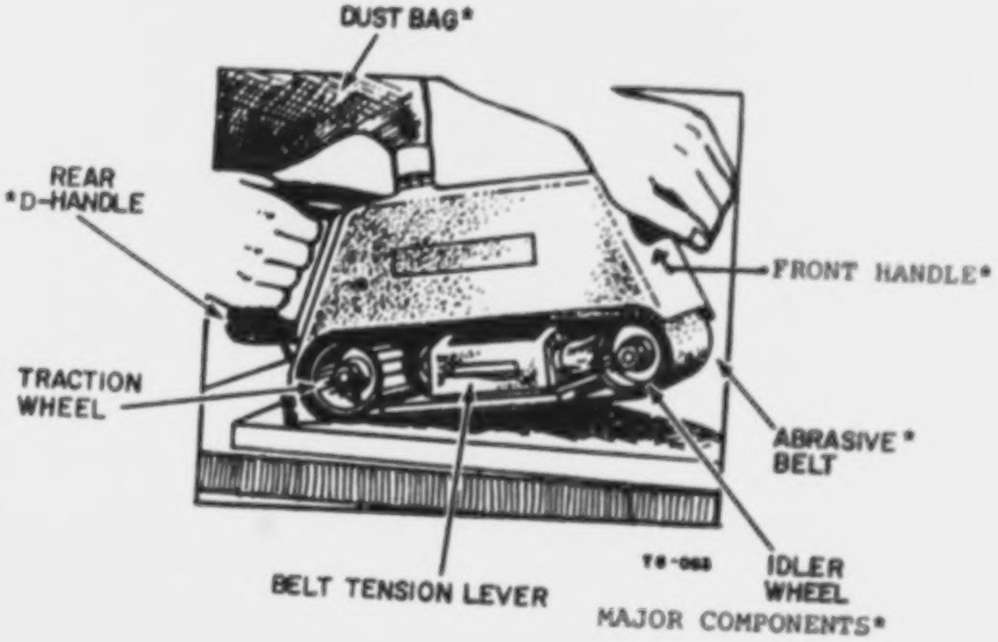


Figure 3-3. Parts of a Belt Sander

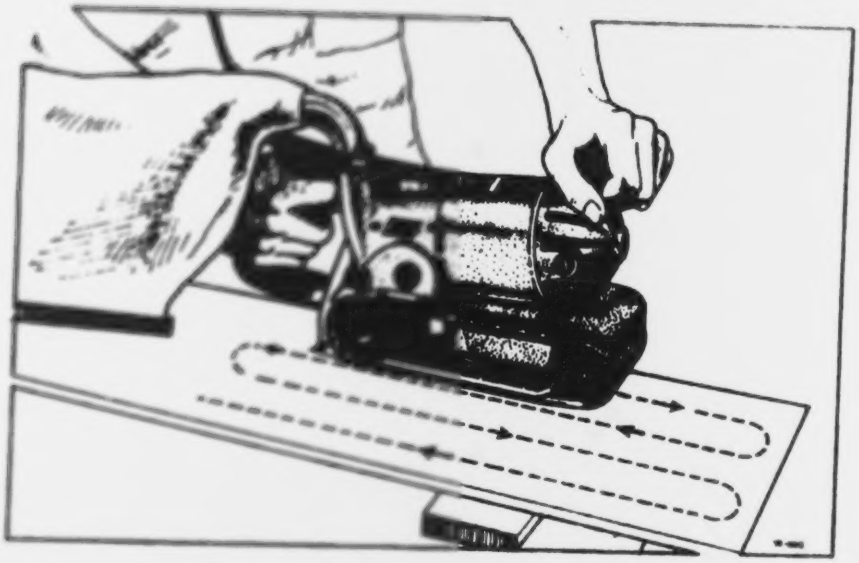


Figure 3-4. Following the Wood Grain When Using a Belt Sander

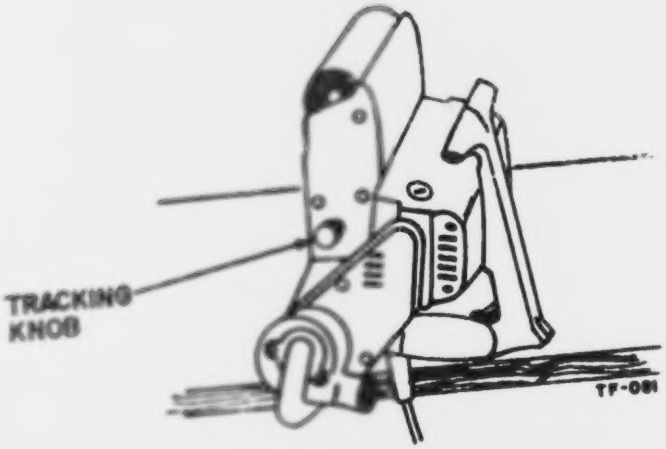

TRACKING KNOB
TF-081

Figure 3-5. Tracking the Sanding Belt

SUMMARY

Using a power sander to accomplish rough and finish sanding can save the craftsman many hours of work and also produce a finished surface, provided they are operated properly. Improper usage of a sander could result in injury to the operator and produce unsatisfactory surfaces.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-II-4

LAMINATED PLASTIC

OBJECTIVE

a. Given procedures, a cabinet or bookcase, equipment, materials and working as a member of a team apply and trim laminated plastics with no more than four instructor assists. Laminate must be bonded, smooth, flush with the edges, and beveled.

INTRODUCTION

The use of plastic laminate (Formica) is a common practice in today's construction. It is used on counter tops and many types of furniture. The ability to correctly use plastic laminate will greatly increase your abilities as a skilled craftsman.

INFORMATION

Plastic Laminate

In your job you will probably be required to install laminated plastics on surfaces, espcially cabinet tops. These plastics are manufactured in sheets or rolls, ready for use; therefore, the only thing you have to do is cut and install them. Laminated plastics also come in different lengths, widths, and thicknesses. To install this material, select the nearest size sheet or roll to the size you need for your particular job. After you have selected the correct size materials, be sure that both surfaces to be bonded are smooth, clean, and dry. Plastics are fastened with contact cement.

Before you open the contact cement container, read the instructions on the label and follow them scrupulously, because the contents in the container are extremely flammable. An electrical arc created by a wall switch or electric motor, for example, could cause a fire or explosion in the presence of a flammable vapor. Contact cement is also harmful or fatal if swallowed; for this reason, you should at all times keep the container closed, and placed out of reach of children.

Shake the contact cement in the container vigorously before you use it. Open the container and spread the contact cement on the back of the laminated plastic and on the surface to which you are going to apply the plastic. One full coat is usually enough on nonporous surfaces (back of laminated materials or metal). Porous surfaces, such as wood or plywood, usually require two coats. When you use more than one coat of contact cement, allow the cement to dry thoroughly between coats.

Be sure that you allow the contact cement to dry before you install (bond) the laminated plastic top. Position the laminate carefully, because no adjustment is possible after the contact cement films make contact. Use scrap plastic, thin wood, wrapping paper, or some other material to separate the contact cement films when you are positioning large pieces of laminated plastics. Apply pressure immediately and firmly with a 3-inch wide roller or a rubber faced hammer, working from the center to the edges over the entire surface. Only momentary pressure is needed, but the more pressure you apply within the limits of the bonded material, the stronger the bond will be.

Trim the edges of the finished surfaces with a router, as soon as you have completed the bonding process. You can eliminate any sharp edges produced by the router with a file.

SUMMARY

The correct application of plastic laminate requires knowledge of the materials you are working with, and the physical skill of application. Without these, the hours spent installing the laminate will be wasted and more time will be required to correct the mistakes.

QUESTIONS

1. When installing plastic laminate, a backing sheet is required for any

   unsupported area greater than ______________________.

2. After the contact cement has dried, what do dull spots in the first coat indicate?

3. Laminate should be cut about ____________ inch larger than the surface being covered.

4. Answer questions 1-9 at the end of Unit 16, textbook, Modern Woodworking.

WORKBOOK
J3ABR55230 000-II-1 thru 4

Technical Training

Carpentry Specialist

CABINET CONSTRUCTION

May 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use

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Number	Title	Page
1	Selecting and Cutting Materials for Cabinet Construction	II-1
2	Cabinet Assembly	II-2
3	Surface Sanding	II-3
4	Laminated Plastic	II-4

This workbook contains the measurement devices designed to ensure that you have mastered the required tasks and knowledges as reflected in the current training standard.

The workbook will be controlled by the instructor at all times and will be used to evaluate your attainment of objectives. Upon completion of each workbook exercise, your response or actions will be graded and annotated as satisfactory (S) or unsatisfactory (U) on the criterion checklist. You must attain a satisfactory grade on all objectives in each instructional unit for the entire block, prior to being administered the end-of-block written test.

This workbook will remain the property of the course and will be destroyed upon satisfactory completion and annotation of objectives in the criterion checklist.

UNDER NO CIRCUMSTANCES will you be allowed to remove this workbook from the classroom and/or training area as applicable unless under the direct supervision of your instructor.

Supersedes WB J3ABR55230 000-II-1 thru II-11-P1, May 1983
(Copies of superseded publications may not be used.)

SELECTING AND CUTTING MATERIALS FOR CABINET CONSTRUCTION

COURSE: J3ABR55230 000

PC: II-1a

PROJECT OR TASK: Operating Power Tools and Equipment

OBJECTIVE:

Given power tools, materials, equipment, and working as a member of a team, exercise safety precautions while operating electrically powered tools and equipment.

INSTRUCTIONS:

1. This is Progress Check II-1a.
2. Your instructor will assign you to a team for the completion of this progress check.
3. You will complete Progress Checks II-1a and II-1b concurrently while working as a team member.
4. As a team member, you must work as an ACTIVE TEAM MEMBER and you will be observed while serving at least two active positions and evaluated in at least two meaningful tasks associated with each objective. Observing or reading a maintenance document does not fulfill this obligation.
5. Instructor assistance will not be provided for completion of the PERFORMANCE portion of this progress check.
6. Use the tools, materials, and equipment provided by your instructor to complete the PERFORMANCE portion of this progress check.
7. Any UNSAFE ACT by a member of a team, could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
8. You must fulfill all obligations outlined for this evaluation.
9. Your instructor will grade this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
10. Upon completion of Progress Checks II-1a and II-1b, return the progress checks to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

This Performance Evaluation will be accomplished concurrently with Progress Check II-1b.

Observe all safety precautions while completing the task described in Progress Check II-1b.

COURSE: J3ABR55230 000

PC: II-1b

PROJECT OR TASK: Selecting and Cutting Materials

OBJECTIVE:

Given procedures, a cabinet plan, power tools, equipment, materials, and working as a member of a team, cut materials to within ± 1/16" of specificaions with no more than five instructor assists. Cutting must be accomplished in sequence using the correct power tool for each cutting task.

INSTRUCTIONS:

1. This is Progress Check II-1b.
2. You must work individually, without instructor assistance, and without notes or reference materials to complete the KNOWLEDGE portion of this progress check.
3. You must provide correct responses to all items on the KNOWLEDGE portion of this progress check.
4. When you have completed the KNOWLEDGE portion of this progress check, return the progress check to your instructor.
5. Your instructor will grade both the KNOWLEDGE and PERFORMANCE portions of this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
6. After grading the KNOWLEDGE portion of this progress check, your instructor will assign you to a team for completion of the PERFORMANCE portion of this progress check.
7. You will complete the PERFORMANCE portions of Progress Checks II-1a and II-1b concurrently while working as a team member.
8. As a team member, you must work as an ACTIVE TEAM MEMBER and you will be observed while serving at least two active positions and evaluated in at least two meaningful tasks associated with each objective. Observing or reading a maintenance document does not fulfill this obligation.
9. Five instructor assists will be available during the PERFORMANCE portion of this progress check.
10. Use the tools, materials, and equipment provided by your instructor to complete the PERFORMANCE portion of this progress check.
11. You must fulfill all obligations outlined for performance evaluation.

12. Upon completion of the PERFORMANCE portions of Progress Checks II-1a and II-1b return the progress checks to your instructor. Progress Checks are controlled items.

MISSION I
(KNOWLEDGE)

Complete the following statements involving the use of power tools when cutting cabinet materials.

1. The dado cut is easily accomplished on the jointer. TRUE FALSE (CIRCLE THE CORRECT ANSWER.

2. The primary purpose of the radial arm saw is ______________.

3. The primary purpose of the table saw is __________________.

4. When cutting dados, the blade depth should be set to 1/4" above the stock. TRUE/FALSE (CIRCLE THE CORRECT ANSWER).

5. Warp in a board (cannot/can) be removed by using the surface planer. CIRCLE THE CORRECT ANSWER.

(PERFORMANCE)

This performance evaluation will be accomplished concurrently with the performance portion of Progress Check II-1a.

Using procedures provided and working as a team member, demonstrate proficiency by completion of the following performance exercise.

1. Obtain cabinet plan from instructor.

2. Read cabinet plan to determine types and dimensions of materials required.

3. Gather material for cabinet.

4. Cut material for cabinet IAW instructions in cabinet plan using power tools (ensure that you use the correct tool for each task).

5. OBSERVE ALL SAFETY PRECAUTIONS.

6. Recheck cut materials to ensure they meet specifications in cabinet plan.

7. Have your instructor check your work.

8. Clean work area.

CABINET ASSEMBLY

COURSE: J3ABR55230 000

PC: II-2a

PROJECT OR TASK: Cabinet Assembly

OBJECTIVE:

Given procedures, tools, previously cut lumber, cabinet plan, materials, and working as a member of a team assemble a cabinet with no more than three instructor assists. Cabinet joints must be tight, square, and within ± 1/16" of true.

INSTRUCTIONS:

1. This is Progress Check II-2a.

2. You must work individually, without instructor assistance, and without notes or reference material to complete the KNOWLEDGE portion of this progress check.

3. You must provide correct responses to all items on the knowledge portion this progress check.

4. When you have completed the KNOWLEDGE portion of this progress check, return the progress check to your instructor.

5. Your instructor will grade both the KNOWLEDGE and PERFORMANCE portions of this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

6. After grading the KNOWLEDGE portion of this progress check, your instructor will assign you to a team for completion of the PERFORMANCE portion of this progress check.

7. As a team member, you must work as an ACTIVE TEAM MEMBER and you will be observed while serving at least two active positions and evaluated in at least two meaningful tasks associated with each objective. Observing or reading a maintenance document does not fulfill this obligation.

8. Three instructor assists will be available during the PERFORMANCE portion of this progress check.

9. Use the tools, previously cut lumber, materials, and cabinet plan provided by your instructor to complete the PERFORMANCE portion of this progress check.

10. You must fulfill all obligations outlined for performance evaluation.

11. Upon completion of the PERFORMANCE portion of this progress check, return the progress check to your instructor. Progress checks are controlled items.

MISSION I
(KNOWLEDGE)

Fill in the blanks with the correct number from the corresponding figures.

_____ 1. Hanging Strip

_____ 2. Gussets

_____ 3. Toe Space

_____ 4. Mullions

_____ 5. Stiles - Cabinet facing

(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completion of the following performance exercise.

1. Assemble the cabinet as indicated in the drawing and specification.
2. Before applying glue, ensure all joints are square and properly fitted.
3. Apply glue and clamps.
4. Check squareness of joints.
5. Adjust clamps if needed to obtain squareness.
6. Nail your cabinet using nails specified in cabinet plans.
7. Inform your instructor when your project is completed.
8. Clean your work area and store your tools.

SURFACE SANDING

COURSE: J3ABR55230 000

PC: II-3a

PROJECT OR TASK: Sanding

OBJECTIVE:

Given procedures, an assembled cabinet, power tools, materials, and working as a member of a team sand a cabinet with no more than two instructor assists. Surfaces must be smooth and free of scratches and splinters.

INSTRUCTIONS:

1. This is Progress Check II-3a.
2. You must work individually and without instructor assistance to complete the KNOWLEDGE portion of this progress check.
3. You will complete the KNOWLEDGE portion of this progress check from memory, using no notes or other reference material.
4. You must provide correct responses to all items on the KNOWLEDGE portion of this progress check.
5. When you have completed the KNOWLEDGE portion of this progress check, return the progress check to your instructor.
6. Your instructor will grade both the KNOWLEDGE and PERFORMANCE portions of this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return your graded progress check to you for review.
8. After grading the KNOWLEDGE portion of this progress check, your instructor will assign you to a team for the completion of the PERFORMANCE portion of this progress check.
9. As a team member, you must work as an ACTIVE TEAM MEMBER and you will be observed while serving at least two active positions and evaluated in at least two meaningful tasks associated with each objective. Observing or reading a maintenance document does not fulfill this obligation.
10. Two instructor assists for the PERFORMANCE portion will be available.
11. Use the tools, materials, and equipment provided by your instructor to complete the PERFORMANCE portion of this progress check.
12. You must fulfill all obligations outlined for performance evaluation.
13. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
14. Upon completion of the PERFORMANCE portion of this progress check, return the progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Complete the following statements and questions pertaining to surface sanding.

1. The portable belt sander is designed to sand ____________ surfaces.
2. Belts for the stationary and portable belt sanders have (printed on the inside) a/an ___________ pointing in the direction of travel.
3. When using the portable finish sander extra ____________ beyond the weight of the sander should not be applied.
4. To change the belt on a portable belt sander you must ____________ the electrical cord.
5. When using the portable belt sander the ______________ should be over the operator's shoulder.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completion of the following performance exercise.

1. If necessary, use a rough sander (i.e., portable belt, stationary disk/belt) to sand areas where large amounts of wood must be removed. Check your cabinet for squareness and against the dimensions given in cabinet plan to determine the need for rough sanding. OBSERVE ALL SAFETY PRECAUTIONS.
2. Finish sand cabinet using vibrating sander and sanding with the grain whenever possible.
3. Remove dust from cabinet.
4. Have your instructor check your sanded project.
5. Clean work area and store tools.

LAMINATED PLASTIC

COURSE: J3ABR55230 000

PC: II-4a

PROJECT OR TASK: Applying Laminates

OBJECTIVE:

Given procedures, a cabinet or bookcase, equipment, materials, and working as a member of a team apply and trim laminated plastics with no more than four instructor assists. Laminate must be bonded, smooth, flush with the edges, and beveled.

INSTRUCTIONS:

1. This is Progress Check II-4a.
2. You must work individually and without instructor assistance to complete the KNOWLEDGE portion of this progress check.
3. You must complete the KNOWLEDGE portion of this progress check from memory, using no notes or other reference material.
4. You must provide correct responses to all items on the KNOWLEDGE portion of this progress check.
5. You must return the progress check to your instructor upon completion of the KNOWLEDGE portion of the progress check.
6. Your instructor will grade both the KNOWLEDGE and PERFORMANCE portions of this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. After grading the KNOWLEDGE portion of this progress check, your instructor will assign you to a team for the completion of the PERFORMANCE portion of this progress check.
8. As a team member, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two active positions and will be evaluated in at least two meaningful tasks associated with each objective. Observing or reading a maintenance document does not fulfill this obligation.
9. Four instructor assists for the PERFORMANCE portion will be available.
10. You must use the tools, materials, and equipment provided by your instructor to complete the PERFORMANCE portion of this progress check.
11. You must fulfill all obligations outlined for performance evaluation.
12. Upon completion of the PERFORMANCE portion of progress check, return the progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Complete the following statements.

1. The substance normally used to bond plastic laminate to another surface is ____________________.

2. The safety equipment that must be worn while cutting laminate is ____________________.

3. Rough cuts for plastic laminates are made 1/8" to 1/4" (larger/smaller) than the surface to be covered. CIRCLE THE CORRECT ANSWER.

4. Edges of the laminate are trimmed (before/after) mounting. CIRCLE THE CORRECT ANSWER.

5. Adhesive must be applied according to _______________ specifications.

(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following performance exercise.

1. Cut plastic laminate 1/8" to 1/4" larger than the surface you are covering.
2. Read and apply adhesive according to manufacturer's specifications.
3. Check surfaces for dryness.
4. Apply laminate.
5. Trim laminate with router.
6. Use a file and bevel the sharp edge of the laminate.

STUDY GUIDE
J3ABR55230 000-III-1 thru III-7

Technical Training

Carpentry Specialist

BUILDING CONSTRUCTION

June 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

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Purpose of the Study Guide

This study guide (SG) is designed to guide you through your study assignment in the most logical sequence for easy understanding and to provide you with practical exercises or work in conjunction with each study assignment. Complete each exercise or work assignment in the sequence given and it will aid you in understanding and retaining the key points in each assignment.

Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Questions will be addressed at that time. SG J3ABR55230 000 Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

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1	Foundation and Form Construction	1-1
2	Light Frame Construction	2-1
3	Scaffold Construction	3-1
4	Roof Construction	4-1
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6	Roofing, Vents, and Louvers	6-1
7	Trim and Siding	7-1

Supersedes SG J3ABR55230 000-III-1, January 1986
(Superseded copies may not be used)

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-III-1

FOUNDATION AND FORM CONSTRUCTION

OBJECTIVES

a. Given incomplete statements, identify the location, construction, and erection procedures for forms for slabs, walls, footings, ramps, and steps by completing the statements.

b. Given procedures, tools, materials, equipment and working as a member of a team construct a form for a concrete slab with no more than three instructor assists. The completed form must be within ± 1/8" of square and level.

INTRODUCTION

As an apprentice carpenter, you will learn the importance of a properly constructed foundation. If the foundation is not constructed correctly the finished structure could be out of square or unlevel. The construction of a sound foundation must therefore begin with the proper layout of the building lines.

INFORMATION

Building Line Layout

General Layout Procedures

Hub stakes are usually set by the surveyor and serve to mark the exact corner location of a building or structure. They also serve as a reference for setting up the batter boards. The batter boards are set 4' or more from each corner of the project. They hold the string lines that determine the building lines and preserve the corner locations. The string lines or building lines are attached to the batter boards and form the exact dimensions of the project. The plumb bob or carpenters level is used to locate the exact corner for the string lines from the hub stakes. A plumb bob is dropped or suspended at each hub stake so it barely rests on the nail driven to mark the exact dimensions. Then the string lines are brought together to form the corners. Figure 1 shows the completed layout work. A carpenter level can be used by placing the end corner on the nail and bringing the strings together to form the corner.

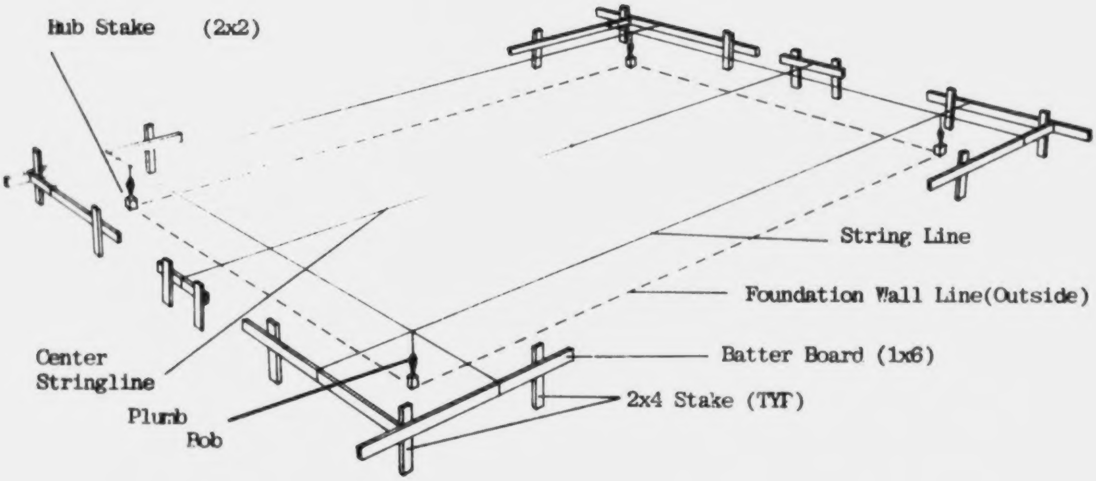


Figure 1. Completed Layout

ESTABLISHING LAYOUT LINES

After a site is cleared the layout lines need to be established before any construction can begin. This starts with setting the hub stakes. All the corners formed by the intersection of the outside surfaces of the foundation walls should have a hub stake driven. It is best to establish the hub stakes and layout lines with a transit, but can be done without. This will be discussed in the following sections.

Squaring

The front stakes of a project are established from measuring out equal distances from a baseline and then getting the right distance between the two end stakes. A baseline is the center of a street, a curb, sidewalk, another building, etc. The back two stakes are then set by using the right triangle method (6, 8, 10 Method) of squaring (Figure 2). Nails are driven in the stake tops once the exact dimension is achieved and the corners are square. These nails mark the exact location of the corner on the hub stake. The right triangle method consists of first measuring 3' from one side of a corner; second, measuring 4' from the other side of the same corner; and third, adjusting the lines until there is 5' between the two points. You can also use multiples of 3:4:5 such as 6:8:10, 9:12:15, etc. Diagonal measuring is the best way to check for squareness (Figure 3). When using the diagonal method of checking, use a tape measure which will reach from corner to diagonal corner. Repeat the process using another tape measure across the other corners. The diagonals of a rectangle or a square will be equal in length if it is square. If not adjust the tapes until both measurements are the same and adjust the hub stakes. The overall dimensions of the building will also need to be rechecked. Remember an out of square project can result in continuous problems all thru the construction of the structure.

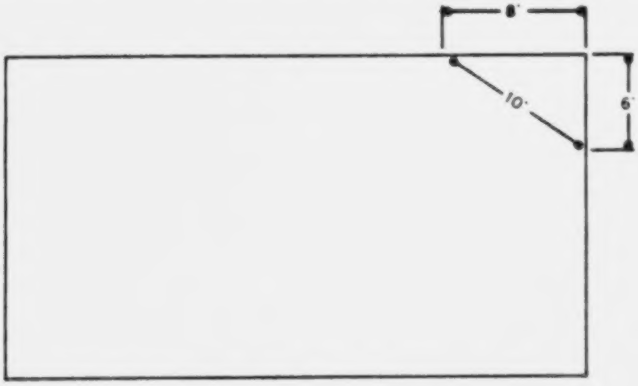


Figure 2. Right-Triangle Method

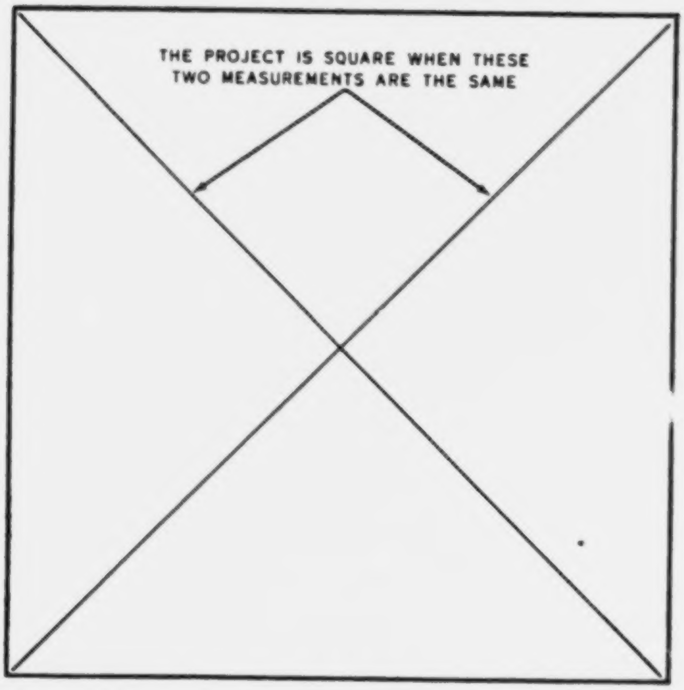

THE PROJECT IS SQUARE WHEN THESE TWO MEASUREMENTS ARE THE SAME

Figure 3. Diagonal Checking

LEVELING

Once the hub stakes are set and the project dimensions are determined, the batter boards must be set up to hold the string lines. The batter boards must all be set at the same level. One of the methods used to level the batter boards is to have them set by a surveyor, which can be costly. Another very reliable method that can be used is a water level. Figure 4 shows how to use the water level.

The stakes should be driven four feet or more away from the hub stakes. Then the first ledger board placed at the height of the project. It should be leveled with a carpenters level and then used as a reference to set the remaining ledger boards. Fasten the end of the tube to the ledger and raise the other end up a stake. When the liquid has leveled off at the same height as the ledger, mark it on the stake. Repeat this process until all the stakes are marked and all the ledger boards are nailed at their proper height. Once the batter boards are up then the string lines can be positioned to determine the building lines. The string lines are held in position by making a saw kerf in the top of the ledger. When all of the preceeding steps are accomplished, the site preparation can take place.

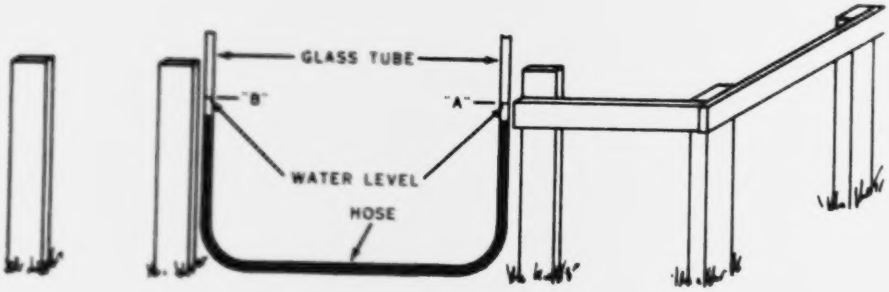


Figure 4. Water Level

Foundations and Form Construction

Types of Foundations

The building blueprints will give details on the type of foundation you must construct. If there is no blueprint, your supervisor will determine the extent and type of foundation to use.

The wall-type foundation is used to support heavy building loads, when permanent-type construction is used, or when a portion of the building is below ground level. It forms a continuous ribbon around the exterior of the building.

A pier and column foundation is used in temporary construction. Piers are spaced under the external walls and girders of a structure. Depending upon the weight they are scheduled to support, piers will be spaced 6-10 feet apart.

Wooden foundations are available for use in any type of temperature and weather. The materials are pressure and chemically treated, which make them useless as a food for insect and fungal growth. The walls may also be fully insulated which increases the usefulness of the living quarters.

Slab construction consists of concrete, for the main floor, placed directly on the ground. The floor may be insulated and a vapor barrier installed to assist in moisture control. A gravel fill is normally placed over the subgrade, this adds insulation and reduces the possibility of the concrete absorbing moisture from the soil. The vapor barrier is installed next followed by the placement of the reinforcing mesh.

FOOTINGS

A structural component of a foundation is the footing. The purpose of footing is to support and distribute the weight of the structure. The footing is located on a firm base, below the frost line and may be poured at the same time as the foundation, or it may be constructed separately. If the footing is constructed in a separate pour, a keyway or metal pins are installed. This serves to lock the foundation to the footing, which prevents the foundation from slipping or shifting on the footing. (Figure 5)

The size and shape of a footing depends on the soil conditions, and building load. In residential building construction, a safe footing design is usually accomplished by making the footing twice as wide as the foundation wall and approximately 8 inches thick. (Figure 6).

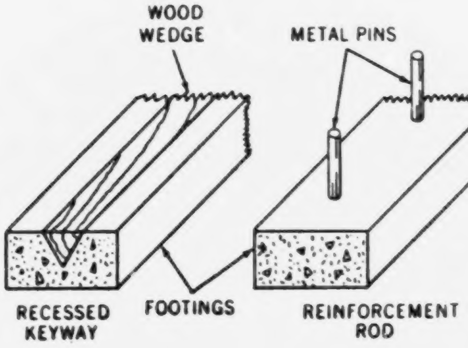


Figure 5. Methods of Locking Foundation to Footing

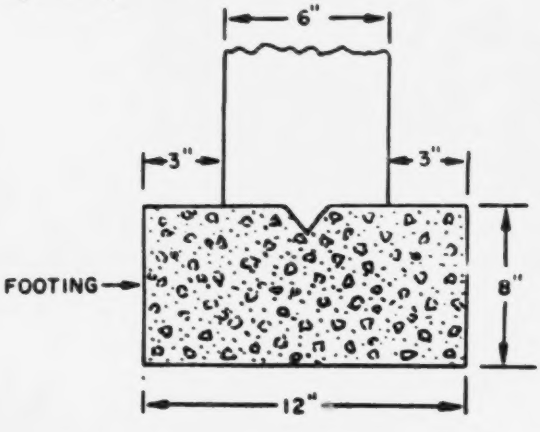


Figure 6. A Typical Footing Design For a Small Building

TYPES OF FORMS

Concrete Foundations

Forms for concrete foundations must be tight, rigid, and strong. If the forms are not tight, there will be a loss of mortar which may result in honeycomb (air pockets), or a loss of water that causes sand streaking. The forms must be braced enough to hold the weight of the concrete. Special care should be taken in bracing and typing down forms for wall-type foundations. In this type of construction and in other types, such as the first pour for walls and columns, the concrete tends to lift the form above its proper elevation. Forms are generally constructed from three different materials. These are earth, metal, and lumber.

Earth

Earth forms may be used in subsurface construction where the soil is stable enough to retain the desired shape of the concrete. The advantages of this type of form is that they generally require less excavation and have greater settling resistance. The obvious disadvantage is a rough surface finish, so the use of earth forms is generally restricted to footings and foundations.

Metal

Metal forms are used where added strength is required or when the construction will be duplicated in several locations. Metal forms are more expensive, but they may be more economical than wooden forms if they can be used often enough. Examples of their use would be in forming slab forms for square or rectangular shaped buildings.

Lumber.

Wooden forms are by far the most common type used in building construction. They have the advantage of economy, ease in handling, ease of production, and adaptability to many desired shapes. Added economy may result as you can reuse the lumber later for roofing, bracing or similar purposes.

Lumber used for forms should be straight, structurally sound, and strong. Soft woods such as pine, fir, and spruce make the best and most economical form lumber since they are light, easy to work with, and available in almost every region. Lumber that will be in contact with the concrete should be surfaced on that side and on both edges. The surfaced side must be turned toward the concrete. The edges of the lumber may be square, shiplap or tongue and groove. The latter makes a more watertight joint and tends to prevent warping.

Plywood can be used economically for concrete forms. You should be sure that the plywood used is made with waterproof glue. Plywood is more warp-resistant and can generally be used more often than lumber.

BEST COPY AVAILABLE

Plywood in thicknesses of five-eights or three-quarters of an inch are more economical as thinner sections will require solid backing to prevent deflection. Plywood of one-quarter inch thickness is useful in forming short curved surfaces.

WALL FORM CONSTRUCTION

Following the site clearing and the rough grading of the terrain, the building lines and batter boards were laid out and installed. It is at this time that the excavation work for the footing and foundation must be accomplished. Before the forms are constructed and installed, and before the footing is poured, the excavation site must be checked to insure that all loose dirt and debris has been removed. Failure to do this may cause excessive settling of the structure and a weakening of the foundation. Any increased depth incurred due to the removal of excess debris should not be backfilled. The additional depth may be compensated by increasing the amount of concrete poured. Remember the bottom thickness may vary as long as the minimum thickness is maintained.

All walls above the ground and many underground walls require double-sided forms. These forms must be strong enough to prevent bulging from the pressure of the wet concrete. There are several different types of wall forms that you may use. The type you select will depend upon the dimensions of the wall to be constructed, availability of form materials, time limits, and cost factors. The most comon type of form used is the full unit form.

Full Unit Form

This form is used for casting long walls in sections. This type of form permits a long wall to be built in sections, using the same form for each of the different sections. After the first section is poured and set, the form is removed and repositioned for the next section. One end of the form is open to fit over the end which is overlapped when the form is shifted to the next section. You can lock the sections by extending the concrete reinforcing steel through the ends of the forms or by forming a tongue and groove. The tongue board should be beveled slightly to allow easy removal of the end of the form.

Layer Unit Form

This form is used to build a wall in successive layers. It is a modification of the full unit form with the sections built up vertically instead horizontally. This type of form is used where high concrete walls, which could not be poured in one continuous operation, are being constructed. Form layers may be tied or locked in a manner similar to the forms of a full unit formed wall.

Continuous Form

The continuous wall form is used when a long wall is to be constructed and cost is no problem. This type of form is not as economical as the full unit form because of the amount of lumber required. However, when time is more important than cost, this type of form is always used.

The construction of most wall forms follow the same basic construction and consist of the following components; sheathing studs or supporters and bracing, Figure 7.

Sheathing is the portion of the form which comes in direct contact with the concrete. It may be lumber or 3/4" plywood. Plywood is more advantageous because of its warp resistance and its ability to be reused. Plywood requires less backing and less manhours are required to construct the forms. The studs

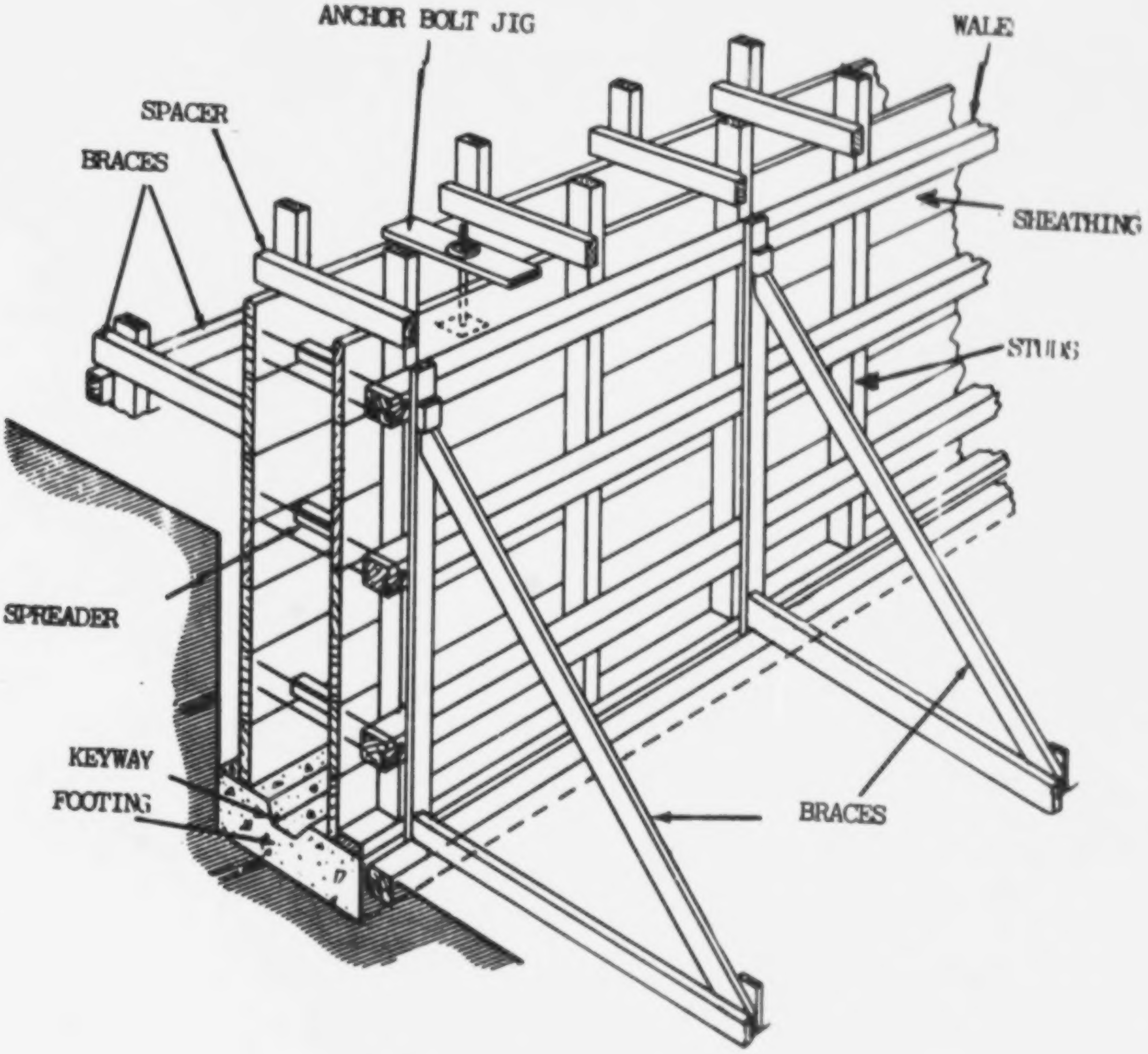

ANCHOR BOLT JIG
WALE
SPACER
BRACES
SHEATHING
STUDS
SPREADER
KEYWAY
FOOTING
BRACES

Figure 7. Wall Foundation Form

provide useful vertical support and are commonly constructed of 2" dimensional lumber. The bracing of a wall form will determine whether or not a form will support the pour, since the bracing is used to provide the strength and rigidity necessary to control the outward pressure of concrete in its plastic state. Adequate bracing is also required to prevent movement of the form during the pour. This movement may range from the form lifting off the footing to nonalignment with the building lines. Either action is nearly impossible to correct after the pour has been made.

Bracing consists of boards nailed to the form supporters or studs and to stakes driven firmly into the ground. Common methods of bracing are illustrated in Figure 8. The size of material and number of braces used must be determined by considering the dimensions and weight of the wall and the stake-holding characteristics of the soil.

When forms require extra strength, they may be braced, or supported, with wales. Wales are beams made from 2-inch or greater dimension lumber of width sufficient to give the required strength. The wales are installed with their edge to the back of the form supporters and horizontally along the length of the form. In addition to toe-nailing the wales to the form supporters with 16d nails, you should install tie wires, or metal wall form ties through the walls.

Tie Wires

Tie wires are usually of soft, black No. 9 wire and should extend through the forms and around the wales and be twisted as shown in Figure 9. Spacers, made of 1 X 2-inch materials, are installed near the tie wires to maintain a uniform distance between the forms when the tie wires are twisted to firmly tighten them. You should nail the spacers, through the form sheathing, with a 6d nail on one end only. This allows easy removal as the concrete is poured.

Snap Ties

Tie wires, for the most part, are rapidly being replaced with manufactured metal devices, known as snap ties. (See Figure 10). These ties are purchased according to the desired wall thickness. Small holes are drilled through the sheathing, studs, and wales to insert the metal rod. Once the forms are in place and the wall ties installed, a small wedge-like clamp is slipped over the ends of the rods and tapped downward with a hammer until the assembly is tight. After the concrete has set and the forms have been removed, these metal rods can be easily broken below the surface, thus allowing the mason to cover them by patching the concrete with grout or mortar.

Another type of wall form tie is the tie rod shown in Figure 11. This rod consists of three sections: an inner section which is threaded on both ends and two threaded outer sections. The inner section, with the cones set to the thickness of the wall, is placed between the forms, and the outer sections are passed through the wales and sheating and screwed into the cone nuts. The clamps are then screwed on to the outer sections to bring the forms to bear against the cone nuts. After the concrete hardens, the clamps are loosened and the outer sections of rod are removed by screwing them out of the cone nuts. After the forms are stripped, the cone nuts are removed from the concrete by screwing them off the inner sections of rod with a special wrench. The cone shaped surface holes that remain may be plugged with grout. The inner sections of rod remain in the concrete. The outer sections and the cone nuts may be reused indefinitely.

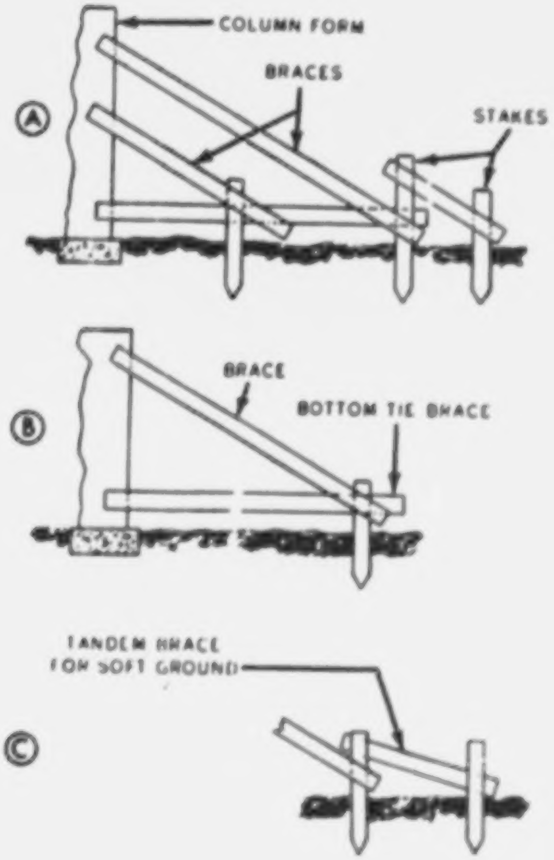

Ⓐ
COLUMN FORM
BRACES
STAKES
Ⓑ
BRACE
BOTTOM TIE BRACE
Ⓒ
TANDEM BRACE FOR SOFT GROUND

Figure 8. Methods of Bracing

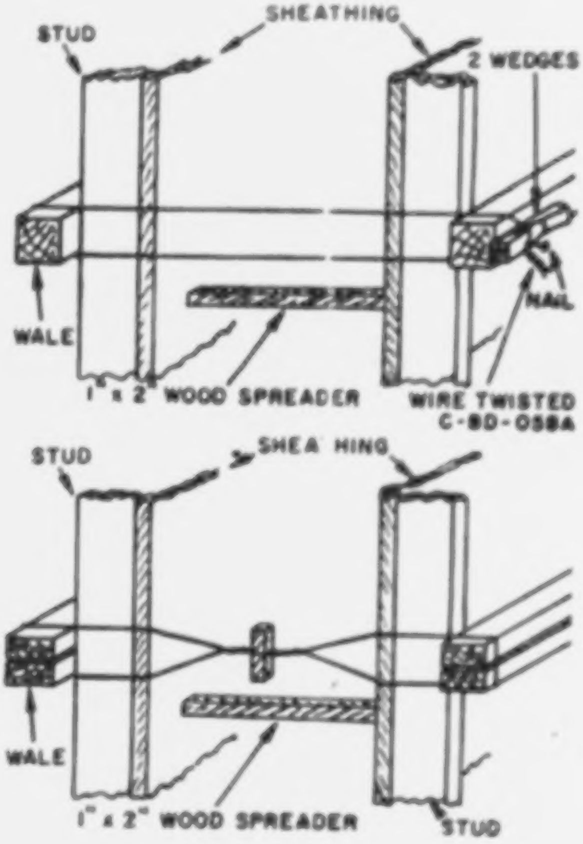

STUD
SHEATHING
2 WEDGES
WALE
NAIL
1" x 2" WOOD SPREADER
WIRE TWISTED
C-BD-058A
STUD
SHEATHING
WALE
1" x 2" WOOD SPREADER
STUD

Figure 9. Tie Wire for Wall Forms

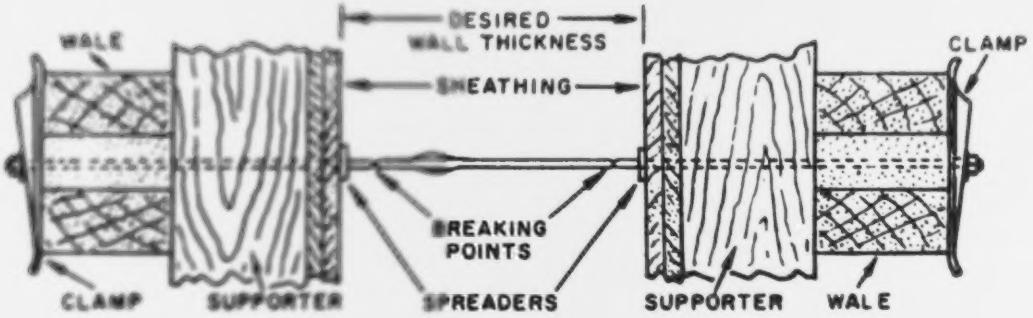

DESIRED WALL THICKNESS
WALE
CLAMP
SHEATHING
BREAKING POINTS
CLAMP
SUPPORTER
SPREADERS
SUPPORTER
WALE

Figure 10. A Typical Wall Form Tie (Snap-Tie)

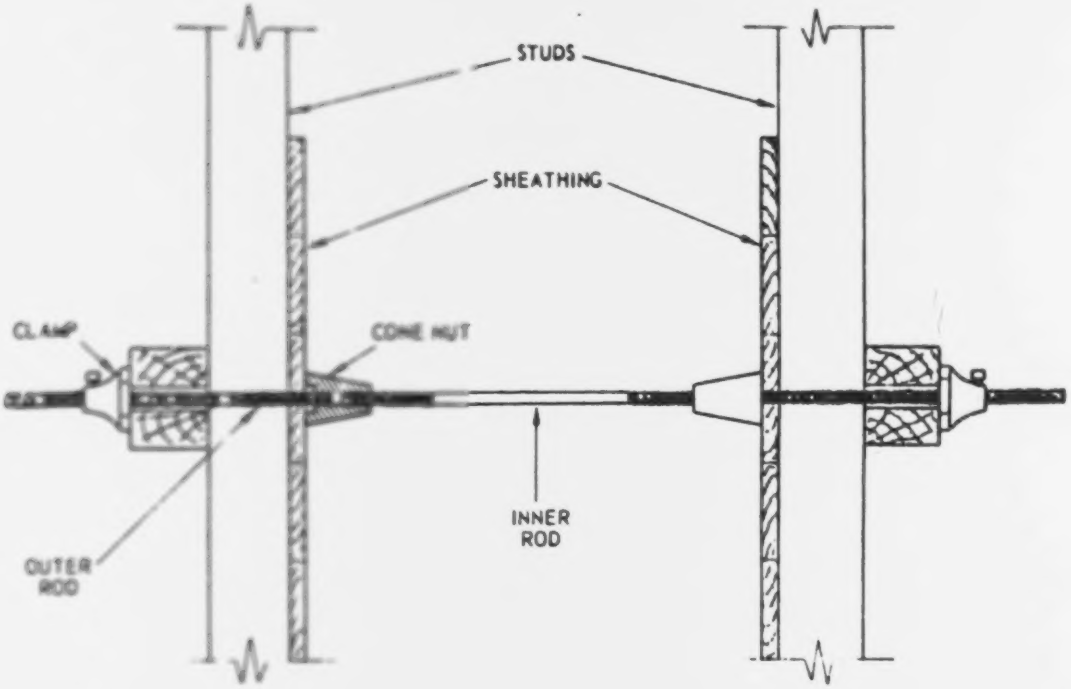

STUDS
SHEATHING
CLAMP
CONE NUT
INNER ROD
OUTER ROD

Figure 11. Tie Rod

FOOTING FORM CONSTRUCTION

Footings should be designed to spread the building load over a sufficient area so there is no possibility of uneven settlement. In small building construction (such as that of family housing or smaller structures) a safe footing design is usually accomplished by making the footing twice as wide as the foundation wall. The average thickness of the footing is approximately 8 inches.

In many instances, it will become necessary to remove the earth (top soil) so that the foundation may be located correctly and supported firmly. The resulting excavations may be located correctly and supported firmly. The resulting excavations may be simple footing-shaped holes for columns, trenches for wall type foundations, or extensive earthwork for basements.

Before you start any excavation work, recheck the location of the batter boards and the excavation lines. If excavations for footings are squared carefully and dug to the correct dimensions, forms for holding the concrete will not be required. This is sometimes termed an "earth" form.

Trenches will usually be as wide as the required footing and located so that the foundation wall will be centered in the excavation. If the wall forms require additional room for placing and bracing, the size of the excavation must be enlarged accordingly. Excavations should never extend below the required depth. If this should happen, the error should not be corrected by refilling with earth. Unless the error is excessive, money and labor can be saved by leaving the void and filling it with additional concrete when the footings are poured.

If the excavation is greater than the width of the footing or if soil is such that the side of the trench will not stand until concrete can be poured, wooden footing forms can be used. These will usually be simple, continuous wall forms anchored with stakes. Grade stakes are driven between the forms to assure proper thickness and easier leveling. You must remove the stakes before the concrete sets and fill the holes with concrete.

Footings are broad flat bases for foundations normally formed of concrete. They may be poured before or with the rest of the foundation. They may be poured before or with the rest of the foundation. Column footings should extend above ground or floor level to protect the column from deterioration due to dampness.

Footing forms are used to increase the area of the base of foundation. A footing is like your own foot; it holds up the whole body and the footing of a building holds up the whole building. This is the easiest form to build (see figure 12).

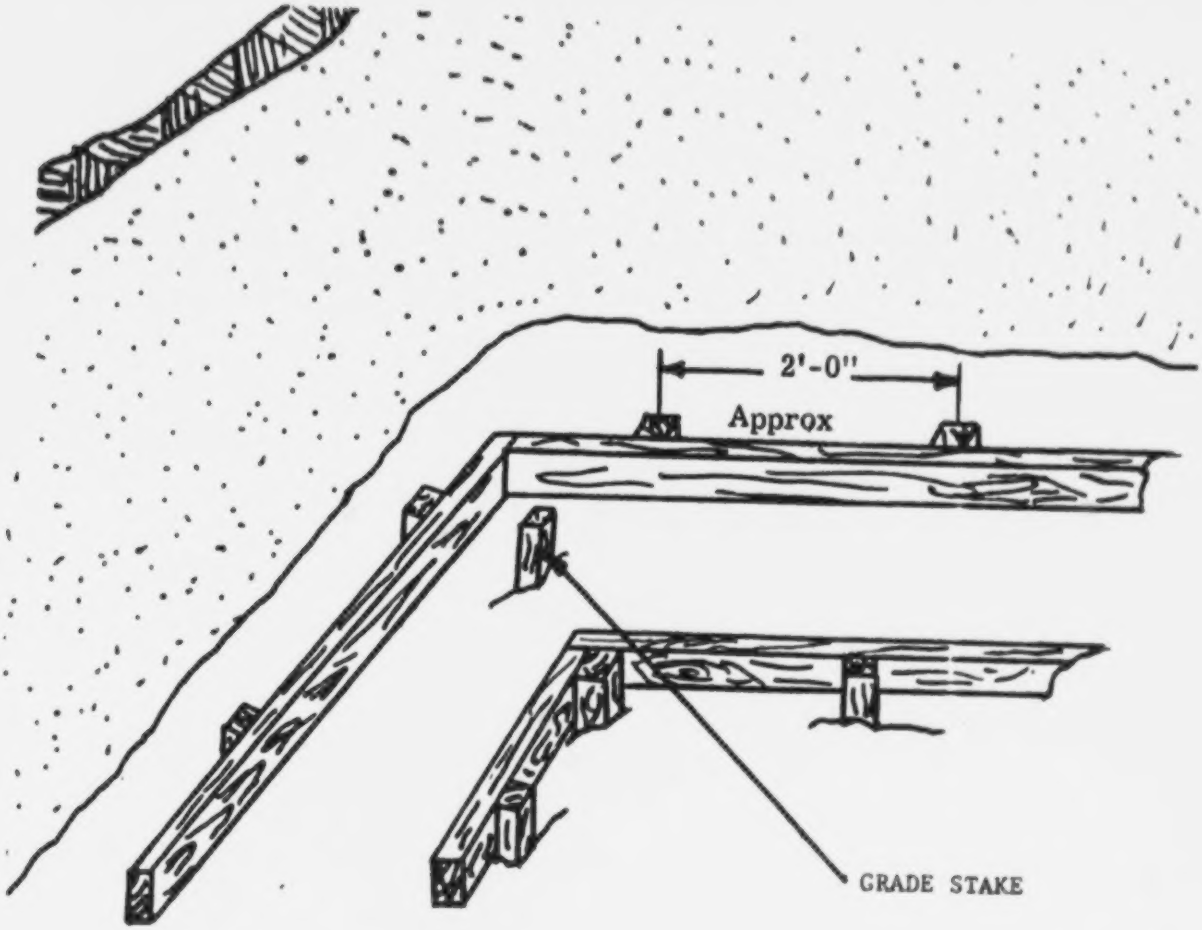


Figure 12. Footing Form

Boards, depending on the thickness of your footing, are held in place by stakes driven into the ground about two feet along the boards as shown in figure 12.

To level the footing forms, use the grade stake which is driven between the footing forms to the elevation you need. By using the carpenter's hand level, transfer the level from the grade stake to your forms; but remember to take the grade stakes out before pouring the concrete.

SLAB FORM CONSTRUCTION

Many commercial and residential structures have been and are now being built on concrete-slab floors. The Federal Housing Authority (FHA) approves only slap-on-ground construction for residential housing projects in certain localities of the country. Prefabricated metal buildings often used by the Air Force can be erected on a concrete slab with a minimum of labor and time. Individual frame or brick-veneer housing units that do not have basements also can be built on slab floors. This kind of construction gives the most value for the money spent. With the cost of labor and materials skyrocketing and the defense budget being cut substantially, the Air Force is now resorting to more and more slab-on-ground construction.

When the building site is relatively level and the soil is stable, a minimum amount of excavation is required for a concrete slab floor. When possible, site preparation should be limited to leveling the area to the grade of the lowest spots. Fills should be avoided to eliminate the time and expense required to compact the soil used in the fills. As a general rule, the less you disturb the natural terrain, the better. Of course, all ground vegetation and organic matter must be removed, but you should try to avoid excessive cuts that require filling. Usually, the load-bearing capability of the soil in its natural state is as great as, or greater than, that which can be obtained artificially unless elaborate soil compaction equipment is utilized.

Either wood or metal forms are used for slab floors. You lay out, stake out, and erect the batterboards, to locate the forms.

Wood forms are generally constructed of 2-inch lumber and 3/4 inch plywood, and they may be from 4 to 12 inches high. The lumber is placed on edge, staked, and nailed into proper alignment. For forms longer than the length of the 2-inch material, place the lumber on edge and end to end. Be sure the lumber is reasonable straight. When you have to remove bows and warping in the lumber to keep it in proper alignment, add additional framing.

When a concrete slab is to be poured, a definite grade is required to obtain the correct thickness throughout the slab. To level the concrete, a system of guides is used. These guides placed at intervals throughout the slab form are called screeds as shown in figure 13.

When this system of screeds is completed, the concrete is poured. A straight edge, resting on the screeds, is worked in a saw like motion to bring the level of the concrete to the top of the screeds.

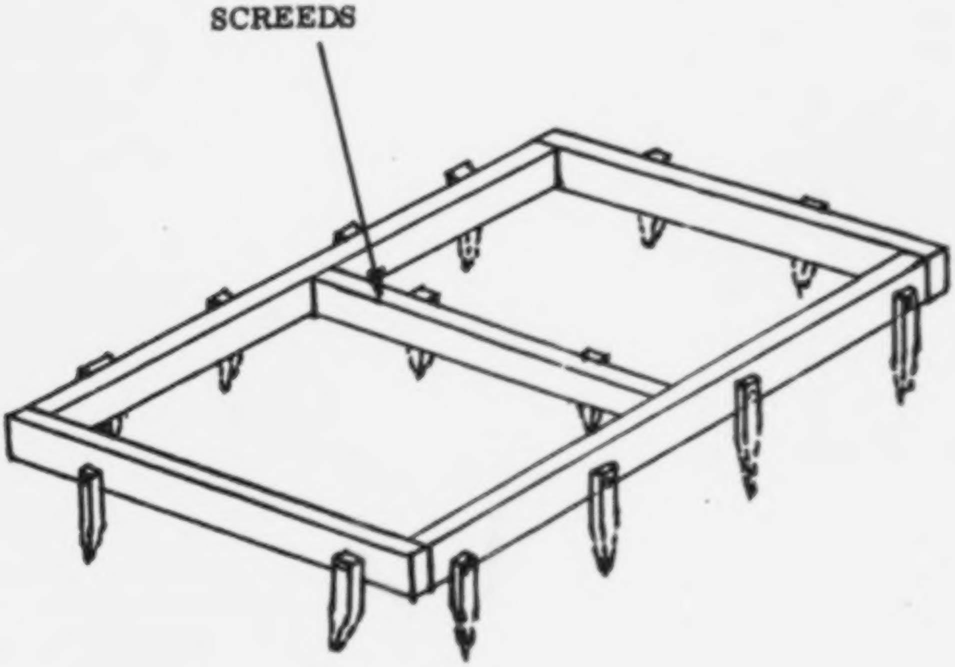


Figure 13. Slab Form

Metal Forms

The standard concrete pavement metal form is very suitable for forming either square or rectangular floor slabs. Steel forms are made in 10-foot lengths and are held in position by three wedged pins and end locks. The standard pavement form is illustrated in figure 14. The weight of the form varies from 204 pounds for 8-inch forms to 292 pounds for 12-inch forms. All standard forms have three pinholes in which pins are wedged to hold the forms firmly in position.

You can use metal forms for square or retangular slabs of any dimension by allowing the run of the form to continue through the corner, as illustrated in figure 15. This arrangement permits use of the form material even though dimensions of the slab are other than even multiples of the 10-foot length of the standard steel form. The end of the form that butts against the side of another form to make the corner may not fit closely enough to prevent leakage when the concrete is poured. In this case, you can seal the corner by placing a piece of thin-gage sheet metal folded to a 90° angle on the inside surface of the corner.

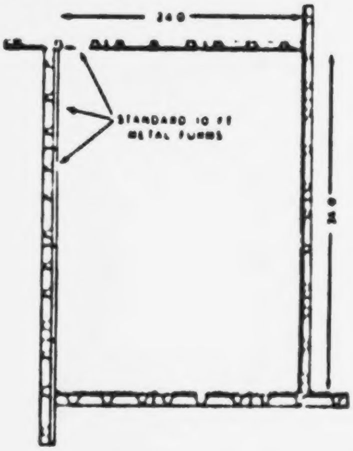


Figure 14. Concrete Pavement Metal Form

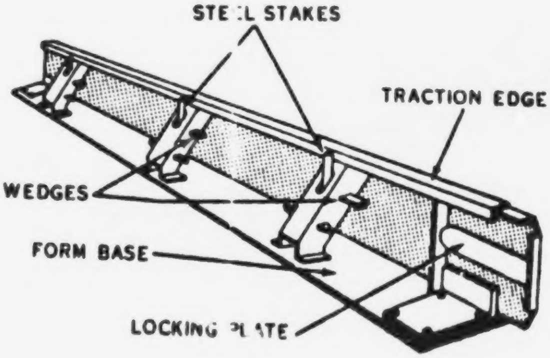


Figure 15. Layout of Metal Forms for a Slab

Setting Anchor Bolts. In slab construction, it is necessary to have some kind of device to hold the wall framing to the concrete floor. Two of the most commonly used methods of fastening the wall framing are with a power-actuated nail driver or anchor bolts.

If anchor bolts are used they must be placed in the wet concrete at the time the slab is poured. Although it is not normally your responsibility to pour or finish the concrete, it will be in your best interest to insure that all the anchor bolts are spaced properly, aligned 90° to the slab, and extended above the concrete far enough to fasten the bottom wall plates securely. An error in placing of the anchor bolts can generate a lot of unnecessary work when you are laying out the wall framing.

STEP FORM CONSTRUCTION

Step forms are built usually from plywood. Step forms of solid pour should not be poured over three (3) feet high.

To construct a step form you will need two plywood sides cut with the right size risers for the steps. Two-by-fours reinforce the plywood sides of this step form by having the 2" X 4" driven into the ground by the sides of the forms, with kicking braces to back up the stakes as shown in figure 16.

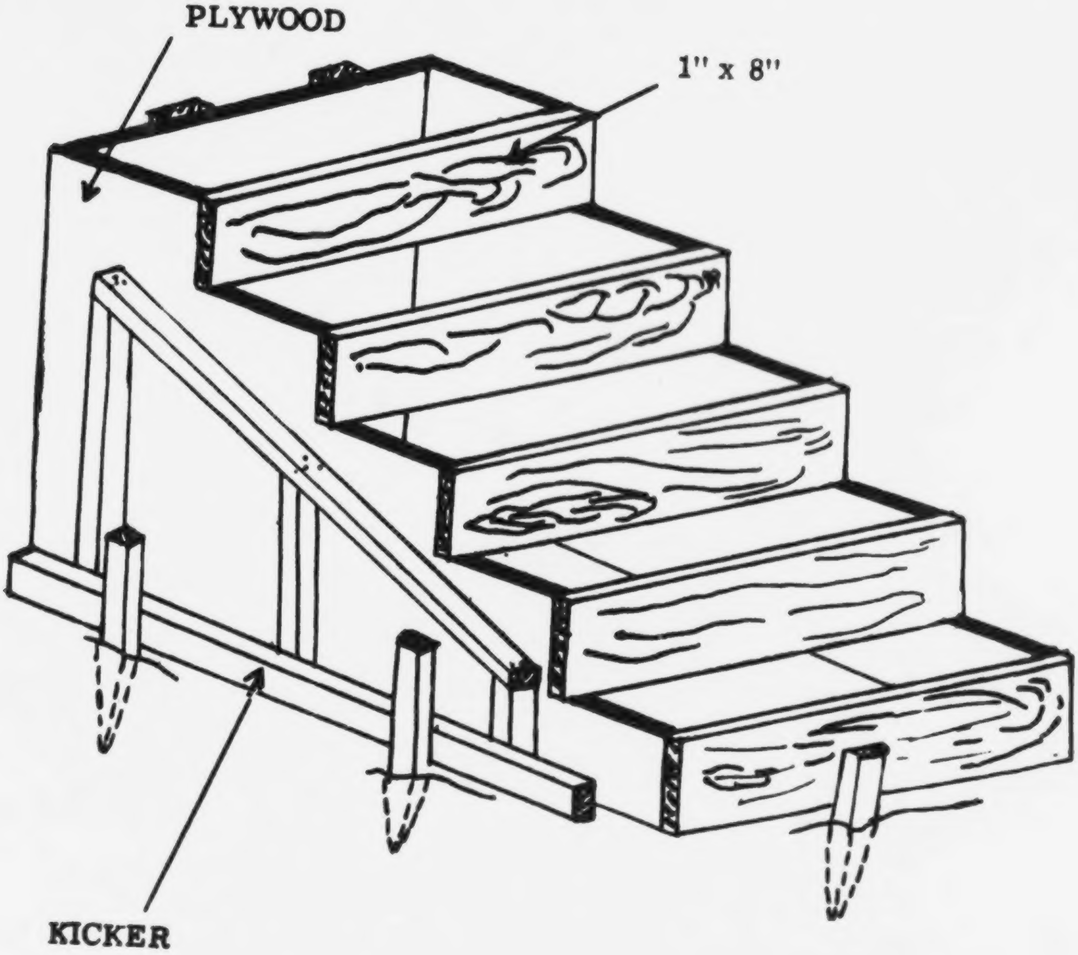


Figure 16. Step Forms

RAMP FORM CONSTRUCTION

As a carpenter you may be called upon to build forms for a concrete ramp. The ramp may be a heavy duty loading ramp such as those used for vehicles at Base Supply or it may be one of the small ramps needed at building entrances for handicapped personnel. The height and width of the ramp will depend on the intended use of the ramp. The slope of the ramp may vary somewhat; however, one foot of rise for 6 feet of length is the slope normally used. See figure 17.

The construction of the forms and the concrete placing and finishing is accomplished in the same manner as described in slab form construction.

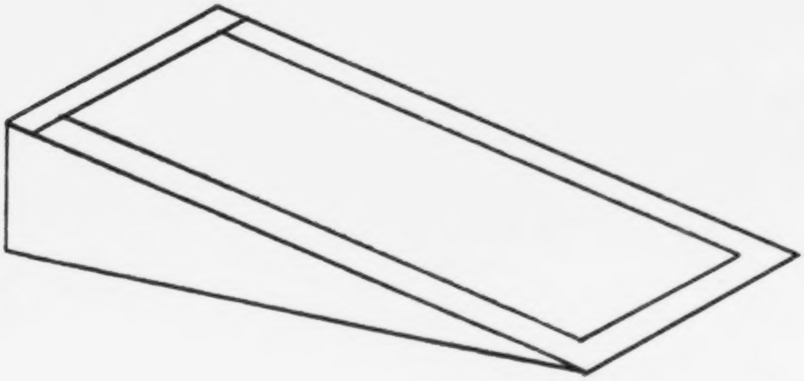


Figure 17. Ramp Form

SUMMARY

A foundation is not a haphazard affair, it requires a skilled craftsman with a thorough knowledge of form construction. The improper erection of forms will not only affect the appearance of the foundation wall, but could also affect its structural qualities.

QUESTIONS

A. Complete the following:

1. ______________ ______________ are used to mark the exact corners of the building.

2. The building layout may be checked for square by measuring the ______________ of the structure.

3. ______________ is used to check a corner for square.

4. Batter boards are established ______________ feet or more from the building lines.

5. Which type of foundation is used in temporary construction?

6. A typical footing is ________ inches deep and ________ as wide as the foundation.

7. What type of form is generally restricted to footings?

8. A ____________ form is used where speed is more important than cost.

9. __________________ are installed horizontally on wall forms and provide extra strength.

10. To prevent movement of the form during the pour, adequate __________ _____ must be installed.

B. Answer questions 1-24, at the end of Chapter 6, textbook Modern Carpentry.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-III-2

LIGHT FRAME CONSTRUCTION

OBJECTIVES

a. Given a foundation wall, tools, materials, equipment and working as a member of a team fabricate and install sills, joists, and subfloors with no more than eight instructor assists. Installed units must be square, plumb, and level.

b. Given a subfloor, tools, materials, equipment and working as a member of a team fabricate and install walls and partitions and frame openings for windows, doors, louvers, and utilities with no more than eight instructor assists. Installed units and openings must be square and plumb.

INTRODUCTION

The framework of a building is the structural skeleton that provides the support for the doors, windows, and roof. Unless the framework is the correct length, strong, straight and square, the building will be weak, unattractive and very difficult to finish.

INFORMATION

FLOOR FRAMING

Following the construction of the foundation walls, the floor frame is erected. There are numerous methods available for the construction of a floor frame, depending upon the type of wall framing used. The two most common types of floor frames are Box-Sill which is used in platform framing and T-Sill which is used with balloon framing.

A Box-Sill is constructed by first securing the sill to the foundation wall. The common sizes of sill material used with a foundation wall is 2 X 6 or 2 X 8. When pier or column type foundations are used, the sill is either builtup (laminated) or solid lumber. The length of the sill is determined by the outside finish of the building. Measurements for the outside of a building are generally made from the outside face of the sheathing or subsiding. If the outside surface of the wall is to be covered with stucco, the outside edge of the sill should be placed even with the outside edge of the foundation wall. When this is done, the sheathing can be carried down and over the foundation wall an inch or so below the bottom of the sill. When siding is used instead of stucco, the siding provides this overlap below the sill for weather protection.

For most types of building construction, the sill is placed with its outside edge 1/2 or 3/4 inches in from the outside edge of the foundation, depending upon the thickness of the sheathing "wall covering". This space will make the outer face of the sheathing flush with the outside edges of the foundation wall.

When a sill of 2-inch material is used, it is a good practice to have one full piece extend the entire length of the wall. If this full length piece is not practical, a butt joint along the exterior wall of the building is sufficient and entirely satisfactory when the sill in anchored properly. A butt joint is also recommended for corner joints with a 2-inch sill. All joints must be made as square and tight as possible.

Anchoring of the sill is important. For the sill to be anchored flat against the foundation, it is necessary to bore holes through it for the anchor bolts. Because the location of the sill on the foundation determines the size of and squareness of the building, these bolts and bolt holes must be laid out very accurately. The hole locations on the sill are usually marked by placing the sill on top of the foundation beside the anchor bolts. Bolt spacing can be marked along the sill, but the distance of the bolt from the edge must be determined by measuring. The distance from the outside edge of the foundation wall to the center of each bolt must be determined. If the outer face of the sheathing is to be flush with the outside edge of the foundation, the thickness of the sheathing must be subtracted before marking the position of the sill anchor bolt on the sill. Figure 22 illustrates the laying out of sill bolt hole locations.

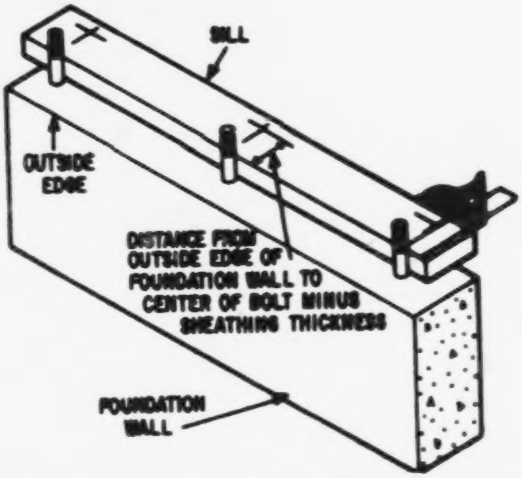

SILL
OUTSIDE EDGE
DISTANCE FROM OUTSIDE EDGE OF FOUNDATION WALL TO CENTER OF BOLT MINUS SHEATHING THICKNESS
FOUNDATION WALL

Figure 22. Laying Out Hole Locations for Sills

Along with the installation of the sill, or just prior to sill installation, the girders are installed. A girder is a large beam that supports one end of the floor joists. It may be made up of several beams nailed together with 16d common nails, or it may be constructed of solid wood, steel, reinforced concrete, or a combination of these materials. A girder is used when the distance between foundation walls is so great that an additional support is needed to support the ends of floor joists.

The girder is installed on the end walls of the foundation, flush with the top of the sill and requires a minimum of 4" bearing surface, (Figure 23). Girders are supported by piers or columns, spaced 6' to 10' along the span of the girder and all joints in the girder must fall over a support. Girders are normally spaced 8' to 14', depending on the load and construction design.

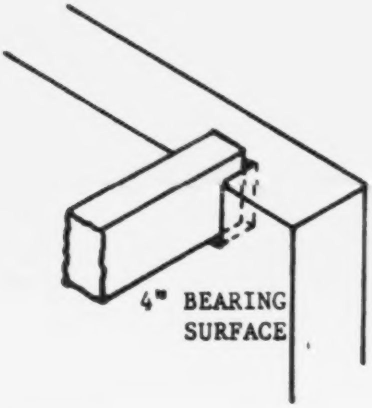


Figure 23. Girder Position

Once the sills and girders are in place, you may install the floor joist. Floor joists are wooden members which make up the body of the floor frame, they support the live and dead loads of the rooms they span.

Joists should be long enough to give the proper bearing at each end. In frame buildings a minimum of 3 inches is usually satisfactory for ceiling joists, but at least 4 inches is preferred for floor joists. These sizes make the total length of the joists either 5 or 8 inches longer than the distance between the inside faces of the framework on which they rest. The bearing for joists in masonry work should never be less than 4 inches. With stone, rubble, and similar material, a minimum of 6 inches is recommended because of possible irregularities of the supporting material.

Joists may be spaced 12, 16, or 24 inches from the center of one joist to the center of the next one. A distance of 24 inches, however, is sometimes too great for proper stiffness and the 12-inch spacing is considered too expensive in terms of labor and material, except where extreme loads are borne. Although spacing of 16 inches has become the accepted standard for joists, spacing of 24 inches is becoming more popular. Regardless of the spacing that you select, it sometimes becomes necessary to locate one or two joists at certain fixed positions that will not fall at any of the on-center points. This is the case when there is a partition or wall on the next floor (Figure 24) or when there is an opening for a stairway. In any event, it is desirable to start at one end of a building and space joists at 16- or 24-inch intervals, regardless of special joists. This arrangement allows floor materials with dimensions in multiples of 4 feet to be used without cutting. The width or size of a joist is determined by the load placed on it, and the span between support members. The different types of joists used in framing are: common, header, built-up, double or partition, trimmer and tail joists (Figure 25).

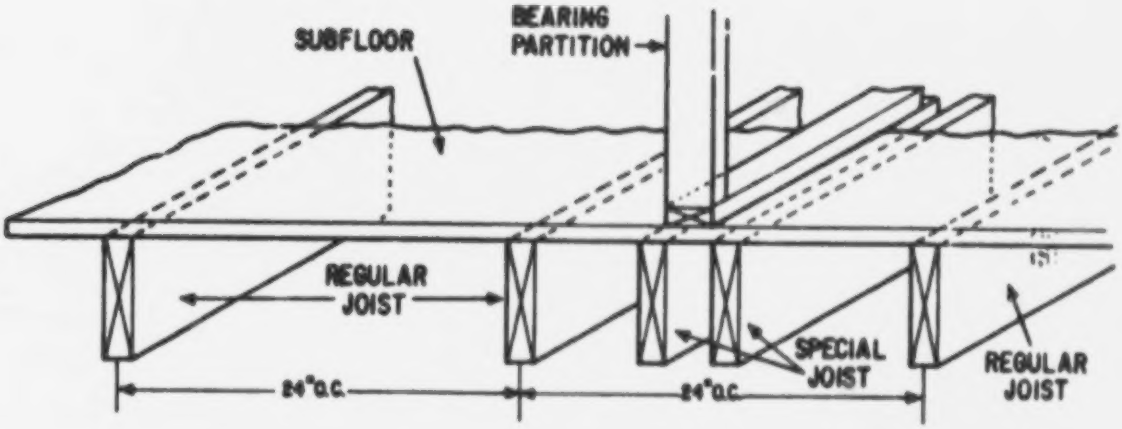


Figure 24. Special Joist to Support Load-Bearing Walls

Common joists run the width of the building. They are commonly spaced 12, 16, or 24 inches on center and are supported by the sills and girders. Common joists are secured by toe nailing 10d nails to the sills and girders, face nailing with three or more 10d to 16d nails where they overlap (at a girder), and butt nailing with three 16d nails to the header joist.

Built-up joists are located at the ends of the structure and under load bearing partition walls where plumbing must be installed. The purpose of a built-up joist is to support the excess load placed upon it. A built-up joist (for endwall application) is constructed by nailing two joists together with a filler material. The filler material is the same width as the joist, spaced about four feet apart and nailed between the joist. The unit is nailed using 16 or 20d nails, spacing the nails 16" O.C. and staggering the nailing patter. When a built-up joist is used to support a load bearing wall requiring plumbing, the filler material will be 2 X 4 blocking.

Double joists are similar to built-up joists. They may be used at the ends of the structure and under load bearing walls. The difference is in their construction, double joists don't require filler materials, and are constructed by nailing two joists together. The nailer procedure is the same as the one used in built-up joists.

Header joists may be either supports used to frame floor openings and support tailjoists or they may be framing members which cap the ends of common joists. When a header is part of the framework for an opening it is normally doubled, secured to the trimmer joists and tailjoists and installed at right angles to the common joists. Headers may be the same size as the common joists but may require a greater width, depending on the load they must carry. Their length is determined by the distance between trimmer joists. Headers are fastened to the trimmer and tailjoists with metal hangers or by driving 16d or 20d nails through the trimmers into the header and by driving 16d nails through the header into the tail joist. When metal hangers are not utilized, it is best to install each member of the header separately and then secure the headers to each other using 16d nails and a staggered nailing pattern (Figure 26).

Trimmer Joists (Trimmers).

The floor framing members which form the sides of an opening that are parallel to the joists are called trimmers. The trimmers support the ends of the headers and carry the weight (load) of the headers and tail joists. Single trimmers are nailed to the sills like joists. The trimmers doubling with a regular joist are spiked to the regular joist and the sill.

When the side of an opening is formed by a regular joist, as item A on Figure 16, the joist is known as a trimmer. In this case, the auxiliary joist B becomes the common joist.

Tail joists are shortened common joists that occur when common joists are cut to form a floor opening. They are secured to the sill like common joists and are butt nailed or hung with metal hangers to the header.

Knowing the types of joists is only beneficial if you can layout and install them. In platform construction, joists are laid out on the header. In balloon construction, joists are laid out on the sill. All standard spaced joists are laid out first, then joists required for floor openings and partitions are added (Figure 27). Notice the edge of the first joist is laid out 15 1/4 inches from the outside edge of the header. This is required to place the joist 16 inches on center from the outside edge of the sill. All other common joists are laid out and marked every 16 inches from the layout mark of the first joist. Once the header is laid out, it should be toenailed to the sill using 10d or 12d nails. The joists are then placed in position and toenailed to the sill with 10d nails and face nailed to the header with 16d nails.

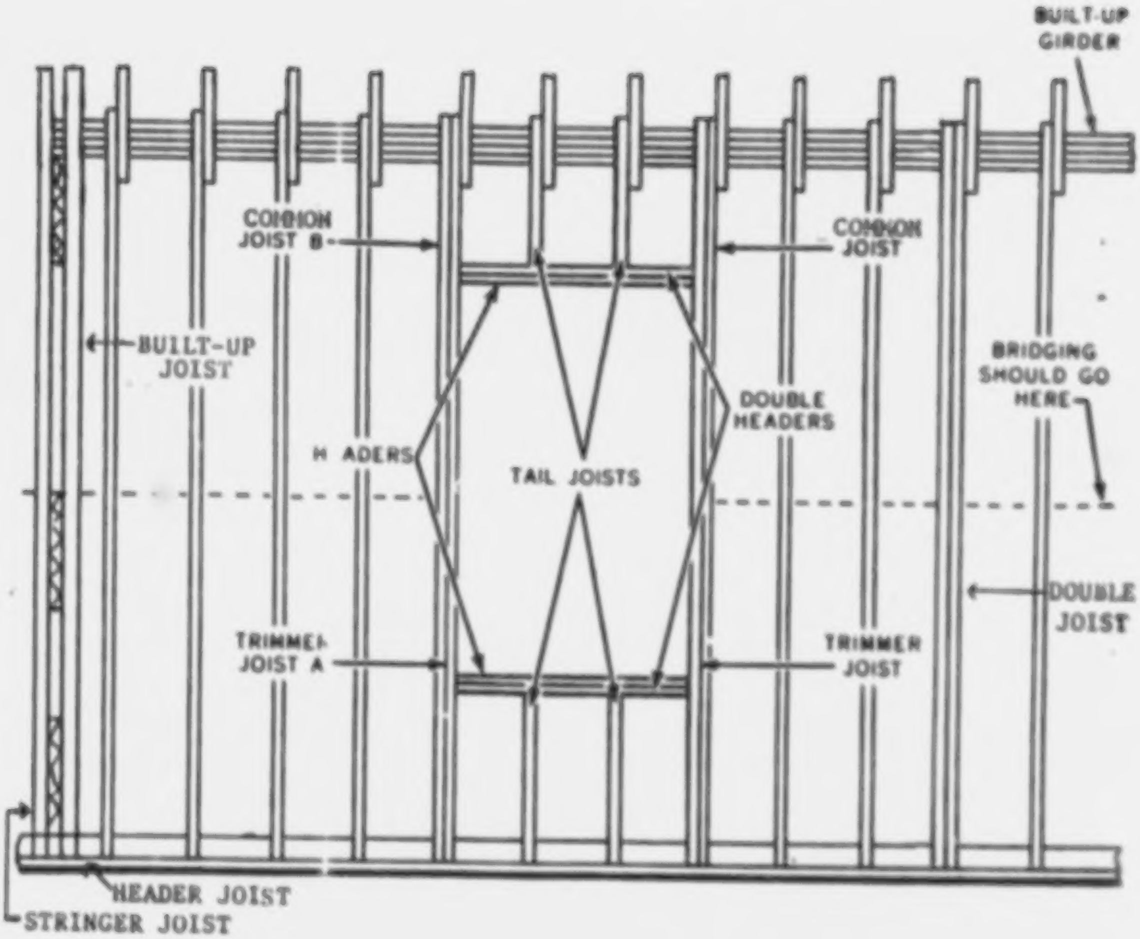

BUILT-UP GIRDER
COMMON JOIST B
COMMON JOIST
BUILT-UP JOIST
BRIDGING SHOULD GO HERE
DOUBLE HEADERS
H ADERS
TAIL JOISTS
DOUBLE JOIST
TRIMMER JOIST A
TRIMMER JOIST
HEADER JOIST
STRINGER JOIST

Figure 25. Joist and Header Trimmers

When joists are being selected and installed, the crowned or curved edge should always be placed up. If the amount of crown is excessive, the piece should not be used for a joist, but it may be placed in some other part of the building where the straightness of the line formed by its edge is not so important. The largest edge knots should also be placed on top, since the top portion of the joist is, in a sense, in the compression state and the knots will have a lesser effect on the overall strength of the joist. Like that of a crown, a joist extremely weakened by knots should be set aside for other less important use.

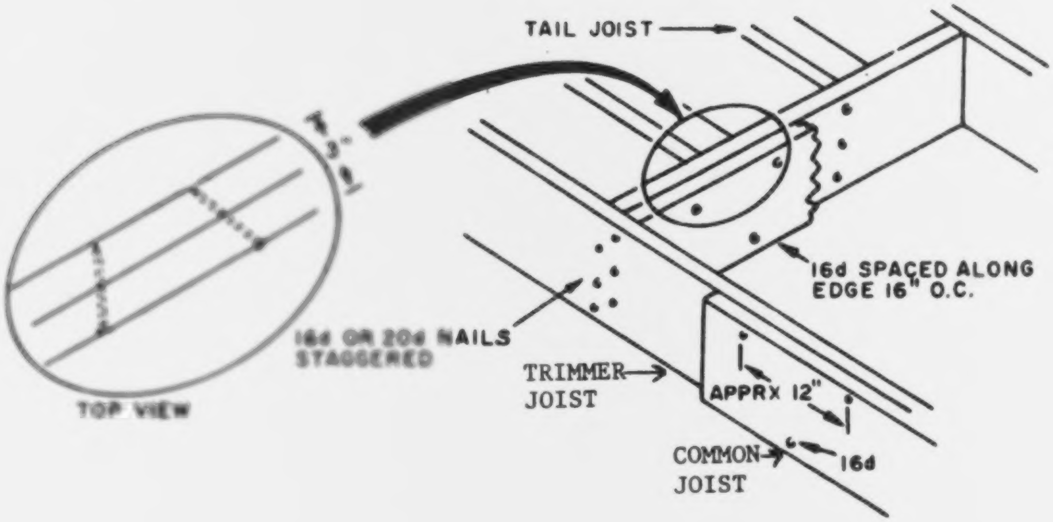

TAIL JOIST
3"
16d SPACED ALONG EDGE 16" O.C.
16d OR 20d NAILS STAGGERED
TOP VIEW
TRIMMER JOIST
APPRX 12"
COMMON JOIST
16d

Figure 26. A Nailing Pattern for Access Opening in Floor and Ceiling Joist

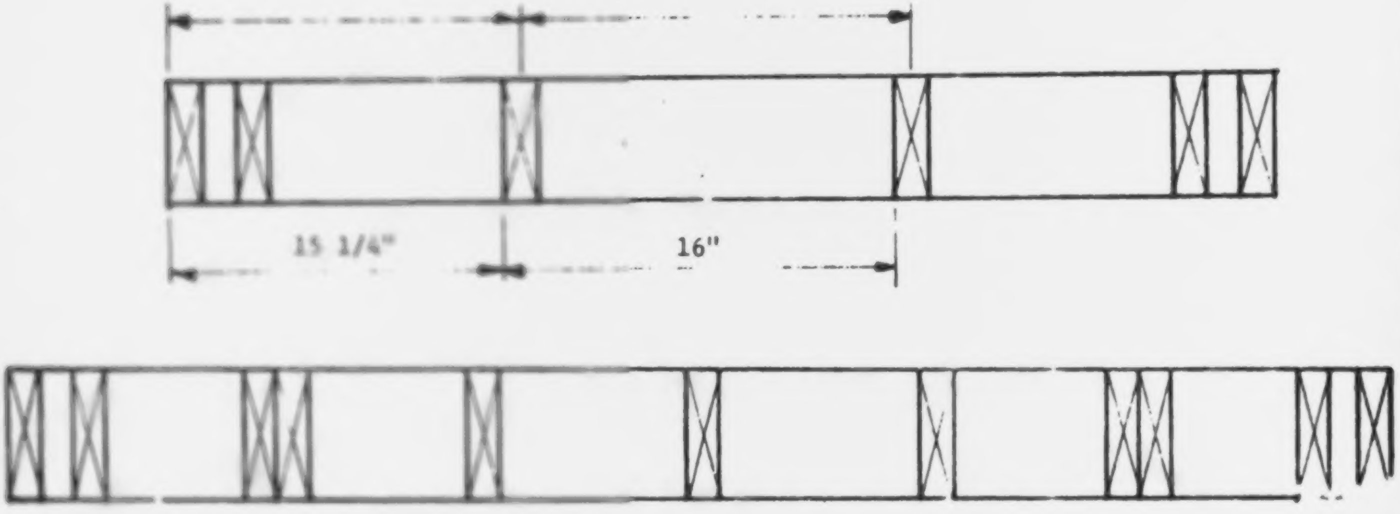


Figure 27. Standard Joist Spacing 16" OC and Additional Joist Layout

The number of joists required for a standard spacing of 16 inches O.C. is determined by taking three joists for every four feet and multiplying this by the length of the side wall, then adding three. Or more simply:

3/4 X Length of Side Wall + 3 = # of joists

Example: Bldg size 15 X 40

3/4 X 40 + 3 = # of joist

120/4 + 3

30 + 3

33 = # of joist

40 is the equivalent of $\frac{40}{1}$, therefore $\frac{3}{4} \times \frac{40}{1} = \frac{120}{4}$

30 is obtained by dividing 120 by 4

This doesn't take into account the extra joist required for partition support, framing openings or header joists. This formula also assumes that all joists run the full width of the building.

Additional support is added to the floor frame by installing briding. Bridging is used to stiffen the floor frame and help distribute the load placed on the floor over a greater area. Bridging may be cross (Herringbone), solid, or steel.

Solid bridging is placed between the joists near the girders and ties the joists together, preventing them from tipping or leaning. This bridging is usually made of joist material to fit between regular joists. For easier installation and better nailing, the solid bridging should be installed at the same time the joists are nailed in place. Solid bridging is secured by toenailing to the girder and the joist already installed with 10d or 12d nails and face nailing the joist being installed to the bridging, with 16d nails. (Figure 28).

This type of bridging also serves as a fire stop. By obstructing circulation of air through the walls and in the area between the ceilings and floors of structures of more than one story, such bridging can delay the movement of hot gases and flames.

Cross bridging is installed diagonally between joists and is installed in rows at right angles to the common joist (Figure 29). The rows are normally spaced 5' to 8' apart which provides maximum rigidity and weight displacement. Bridging is laid out with a framing square and may be cut with a handsaw or power equipment. Cross bridging is normally constructed out of 1 X 4 material and secured with 2 - 8d nails at each end, but it may be constructed out of 2 X 4 material. When securing cross bridging it is best to nail the tops, install the subfloor, then nail the bottoms.

Steel bridging serves the same purpose as cross bridging, but is a pre-manufactured item and should be installed according to manufacturers specifications.

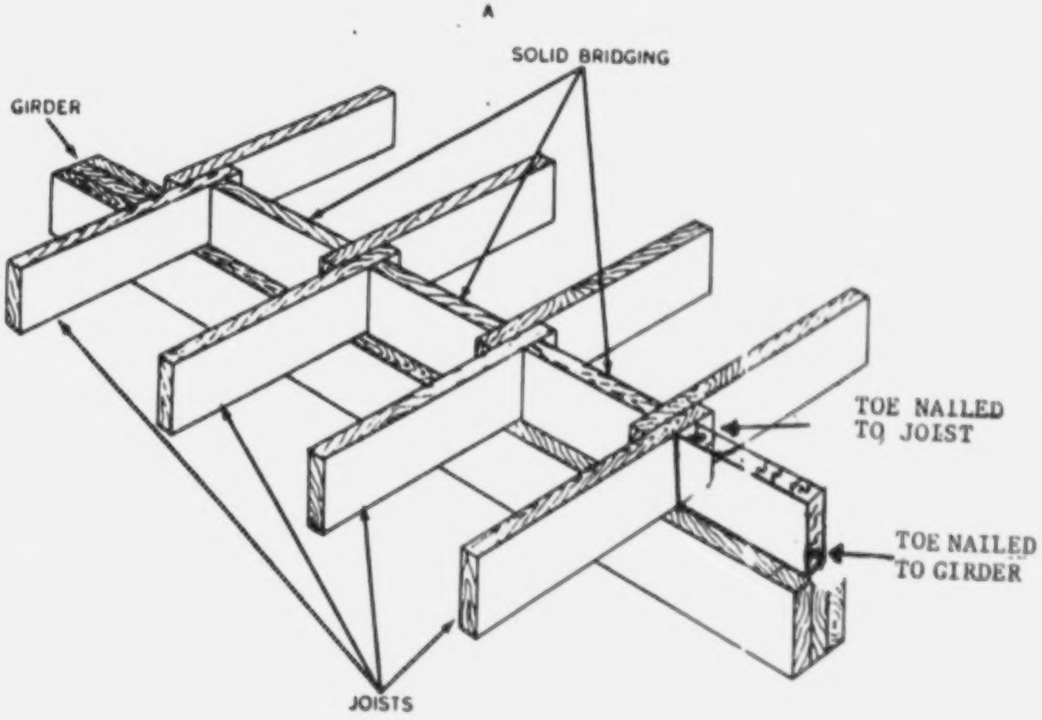


Figure 28. Solid Bridging

SUBFOORS

The subfloor is the material which is laid directly on top of the floor joists. It helps to stiffen the floor and align the top edges of the joists. It serves as a working surface while the building is being constructed, and forms a base to which the finished flooring can be nailed. In light frame construction where joist framing is spaced 24 inches or less on center, either 1" common lumber 1/2" to 3/4" plywood or 3/4" tongue and groove flooring may be used. When the spacing is greater than 24 inch centers, special tongue and groove plywood or 2" thick tongue and groove subflooring may be used.

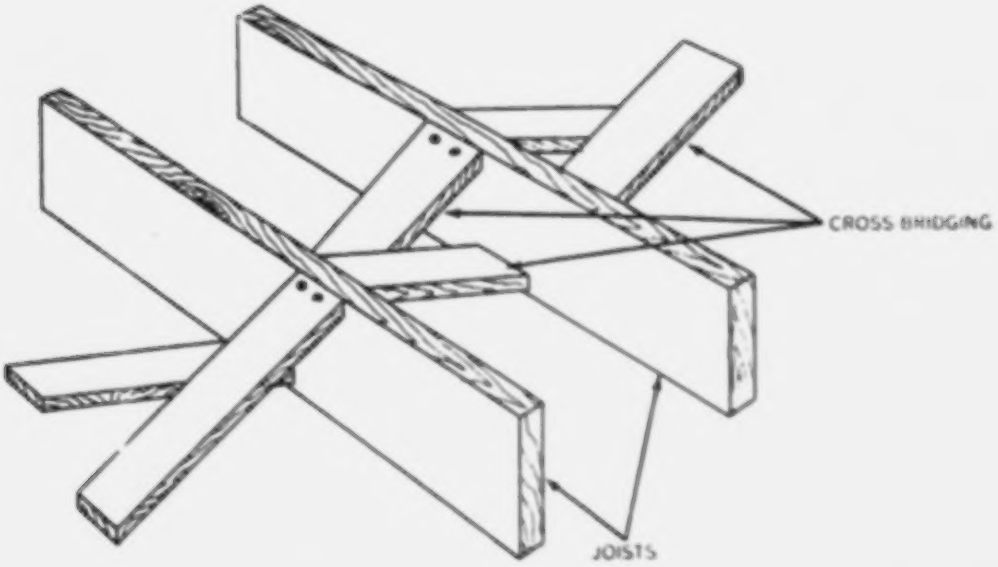


Figure 29. Cross Bridging

When common lumber is used as a subflooring material, it may be installed at right angles to the joists or diagonally to the joists at a 45° angle. The preferred method is to install common lumber diagonally to the joists. This strengthens the floor, prevents squeaks and allows the finish floor to be installed in any direction.

Common lumber sizes for subflooring range from 1 X 4 to 1 X 12, with 1 X 6 and 1 X 8 being the preferred sizes. It should be installed with a 1/8 inch gap along the sides, a 1/16 inch gap at the ends and all ends should rest on a joist. Common lumber is secured with 6d coated or 8d common nails. Lumber which is 6 inches or less receives 2 nails, 8 inch lumber receives 3 nails and 10 or 12 inch lumber receives 4 nails at each joist. (Figure 30).

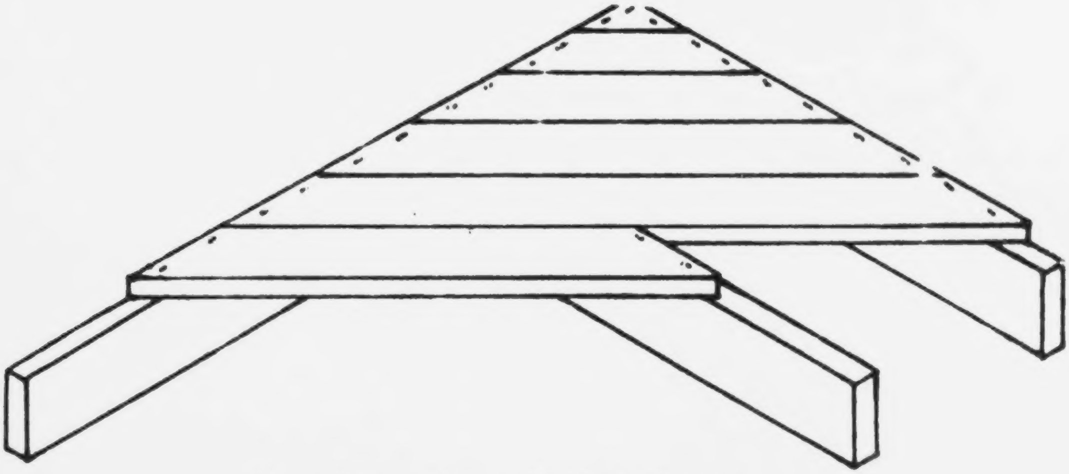
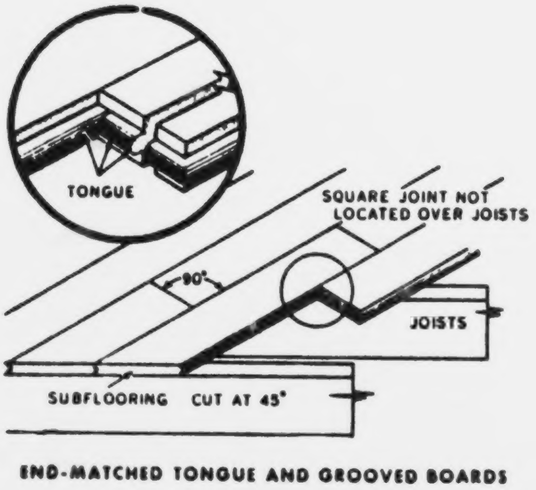


Figure 30. Diagonally Laid Common Lumber Subflooring


TONGUE
SQUARE JOINT NOT LOCATED OVER JOISTS
90°
JOISTS
SUBFLOORING
CUT AT 45°
END-MATCHED TONGUE AND GROOVED BOARDS

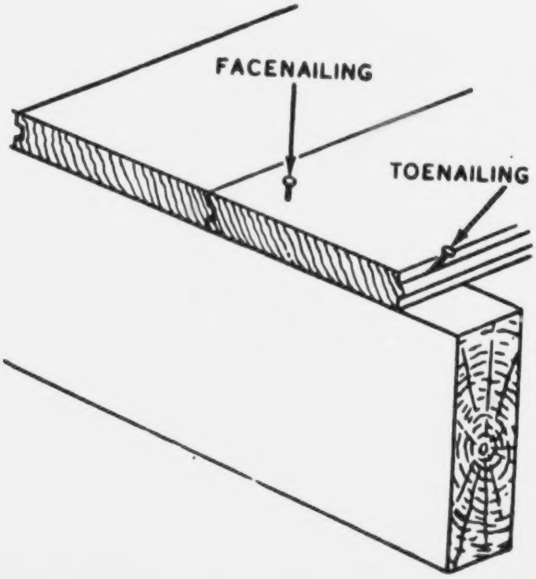

FACENAILING
TOENAILING

Figure 31A. Diagonally Laid Subflooring

Figure 31B. Nailing Tongue-and-Groove Boards

Tongue and groove flooring is installed diagonally to the floor joist and doesn't require the ends to fall on a joist, when end matched "T and G" flooring is used (Figure 31A). "T and G" flooring is secured by toenailing through the tongue to drive the flooring tight to the adjacent piece and then face nailing (Figure 31B).

Plywood is used extensively in modern construction. It provides a more rigid frame and is faster to install than other subfloorings. Plywood subflooring is commonly installed in 4' X 8' sheets with thicknesses ranging from 1/2" to 3/4". Plywood is installed with its long dimension at right angles to the joist. It requires a 1/8" gap along the sides, a 1/16" gap at the ends and all end joints must fall on a joist. A standard nailing procedure for plywood is to secure it with 8d nails, nailing every 6 inches along the edge and every 10 inches thru the center joists.

WALL FRAMING (Platform Construction)

Wall framing is composed of plates, studs, cripple studs, trimmers, headers, diagonal bracing, and fire blocks. The studs are supported by the sole plate and are capped with the top plate. Since the wall frame begins with the layout of the sole and top plates, we will discuss them first.

A top plate is a horizontal member of a partition or frame wall. It serves as a cap for the studs and a support for the joists, rafters, and studs. Figure 32 shows double top plates that are lapped for greater strength. Top plates tie the studding together at the top, and insure stud alignment, provide support for structural members above the plates, and also provide a base for the roof rafters which tie the roof and walls together.

Where the wall studs do not rest on a sill, girder, or beam, a sole plate should be used (with dimensions not less than the studs). A typical layout of studs on the sole plate is illustrated on Figure 33. Notice the regularity of the spacing interval except where partitions or walls are intersected (the actual plate layout will be discussed later in this section). Corner posts, or studs, must be installed at these points. Before we go into the wall layout, let's get acquainted with the members that make up a wall section.

Wall studs are the closely spaced vertical members of partitions and outside walls. Their purpose is to support the weight of the upper floors and provide a framework for exterior and interior finishes (Figure 34).

Common studs are placed on 16" or 24" centers and run from the sole plate to the top plate. They are secured to the sole plate and top plate with two 12d or 16d nails in each end. Trimmer studs frame the inside of door and window openings and are backed by a common stud (This assembly may be known as a King Post). The trimmer stud is secured to the common study with 10ds nails spaced 16" O.C. and to the sole plate with two 12d or 16d nails. Cripple studs are short common studs and are located above door and windows and below windows. They are secured to the sole plate and roughsill or top plate and header (toe nailed to header with 8d nails). Partition posts are used at intersecting walls. They are installed into the main wall and provide a mean of security the intersecting wall to the main wall. It also provides a nailing surface for interior finish materials. The most common design for partition post is obtained by turning a common study flat (spacerstud) and securing it to common studs, one on each side, with 16d nails spaced 12" O.C.

Corner posts are located at all corners of a structure. They support the interior and exterior corners of the structure and provide a nailing surface for the interior wall finish. The most common type of corner post is the built-up corner post. It consists of 3 studs and 3 filler blocks. The 3 filler blocks are evenly spaced between the two studs of the side wall, the third corner post stud is part of the end wall. The corner post may be constructed as a separate unit or as part of each wall and assembled when the

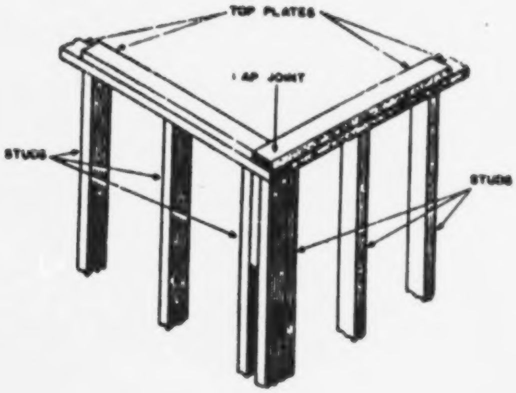

TOP PLATES
LAP JOINT
STUDS
STUDS

Figure 32. Double Top Plate

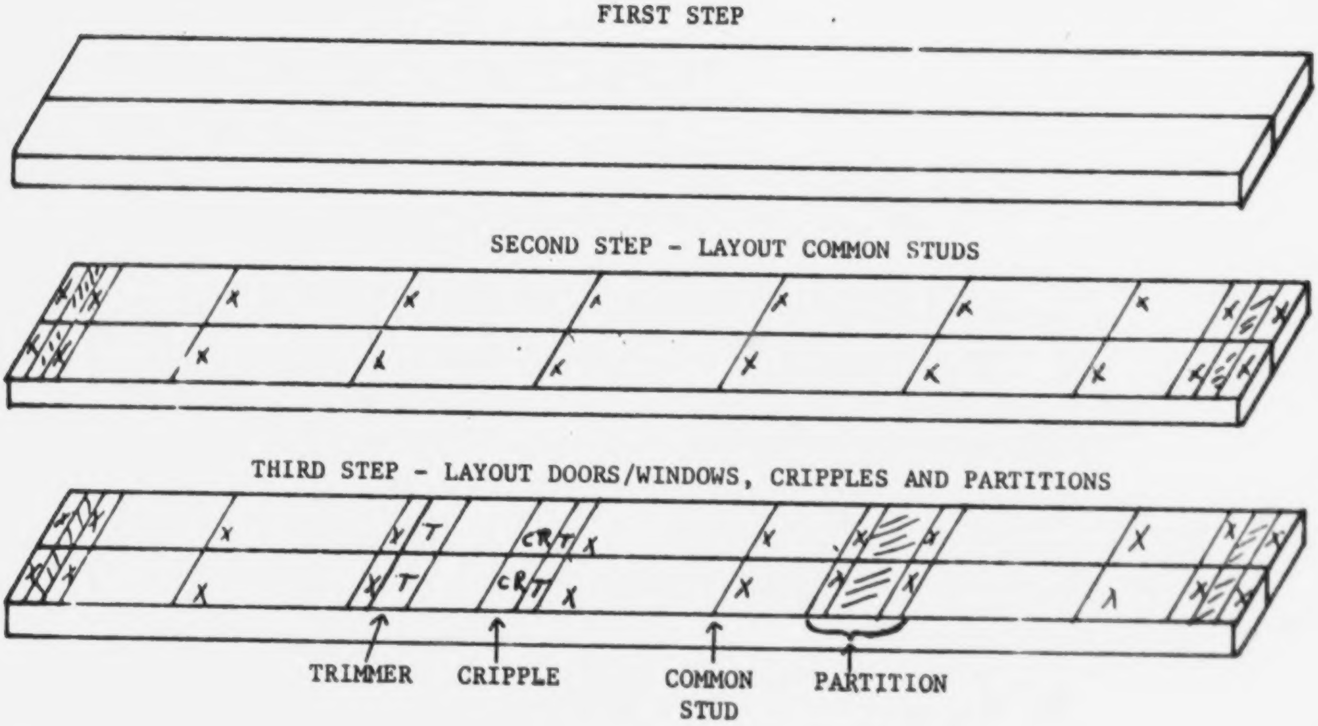

FIRST STEP
SECOND STEP - LAYOUT COMMON STUDS
THIRD STEP - LAYOUT DOORS/WINDOWS, CRIPPLES AND PARTITIONS
T
CR
X
TRIMMER
CRIPPLE
COMMON STUD
PARTITION

Figure 33. Illustrated Stud Layout

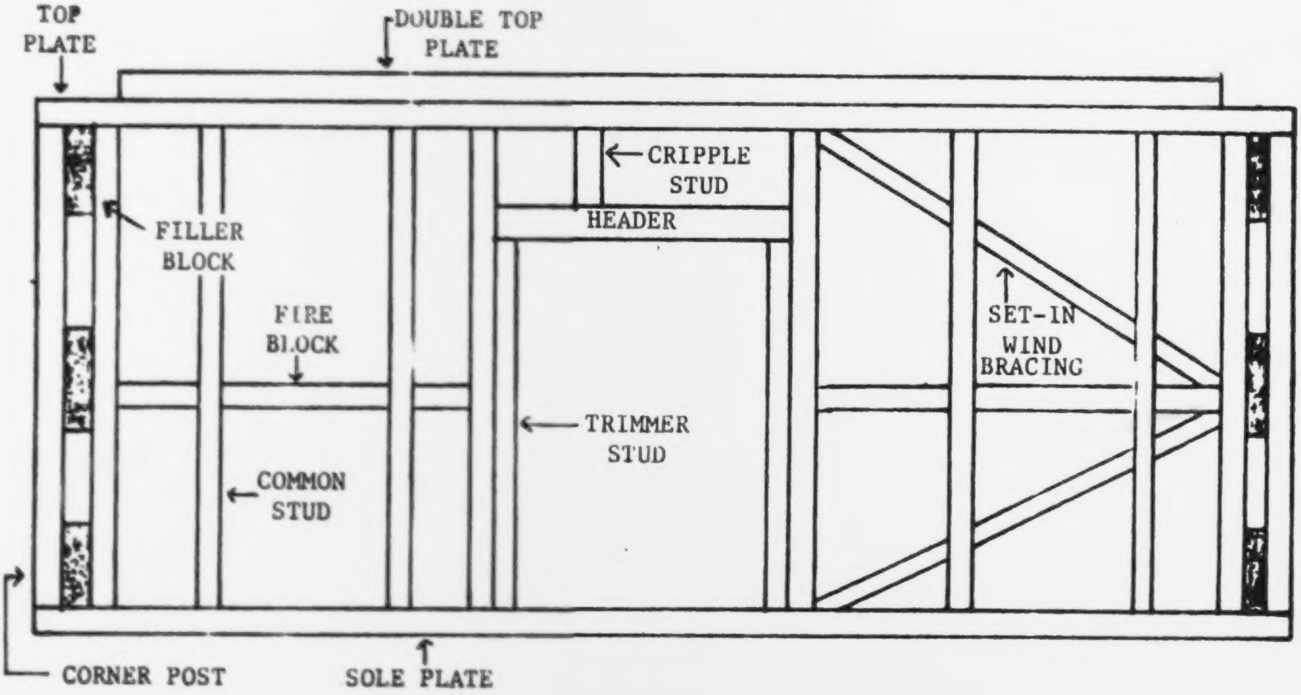

TOP PLATE
DOUBLE TOP PLATE
CRIPPLE STUD
HEADER
FILLER BLOCK
FIRE BLOCK
SET-IN WIND BRACING
TRIMMER STUD
COMMON STUD
CORNER POST
SOLE PLATE

Figure 34. Side Wall Components

walls are raised (Figure 35). Diagonal wall braces are permanent parts of a building which serve to stiffen the walls, keep the corners square and plumb, and prevent the frame from being distorted. Bracing is used at each corner of

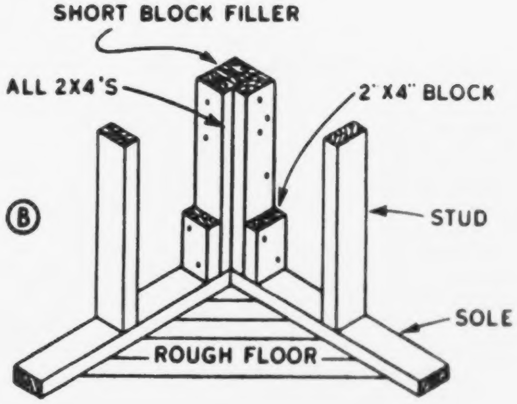


Figure 35. Built-up Corner Post Construction

a building and should extend from the sole plate to the top of the corner post. The angle formed by the bracing and the plate should be from 40° to 60°. The common types of bracing which you will use are let-in, set-in and fire blocking.

Let-in Bracing

This bracing is usually done with 1- 1/4- inch material. In the process of construction, the 1 X 4 is seated into cutouts in the sides of the studs and the corner post. The brace extends in a continuous piece from the sole plate to the top of the corner post, as shown in Figure 36.

Set-in Bracing

Set-in bracing is nothing more than short lengths of 2 X 4s cut at the proper angle and nailed between the studs, as shown in Figure 37. This type of bracing does not have the strength of let-in bracing and also has the disadvantage of hindering the installation of wiring and plumbing. On the other hand, the use of set-in bracing is economical because short pieces of stud material, which might otherwise be considered waste, can be used.

Exterior walls should be braced by diagonal and horizontal supports.

Fire Blocking

Fire blocking is installed hroizontally between the studs, 48" O.C. above the subfloor. Fireblocking stiffens the studs, provides a horizontal nailing surface, and checks the drafts between the studs. Care should be taken during their installation to prevent forcing the studs out of alignment.

Headers are installed to carry the load over door and window openings. They are supported by trimmers and are classified as loadbearing and non-loadbearing. Loadbearing headers are positioned in walls which carry the ends of floor joist and support the weight of the floor above. Non-loadbearing headers run parallel to the joist and don't carry any weight (Figure 38).

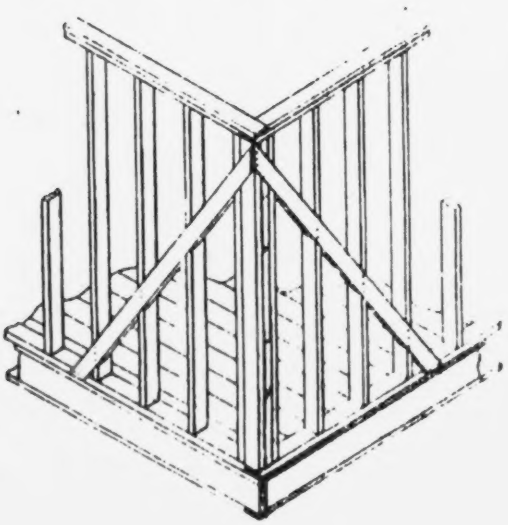


Figure 36. Let-in Bracing

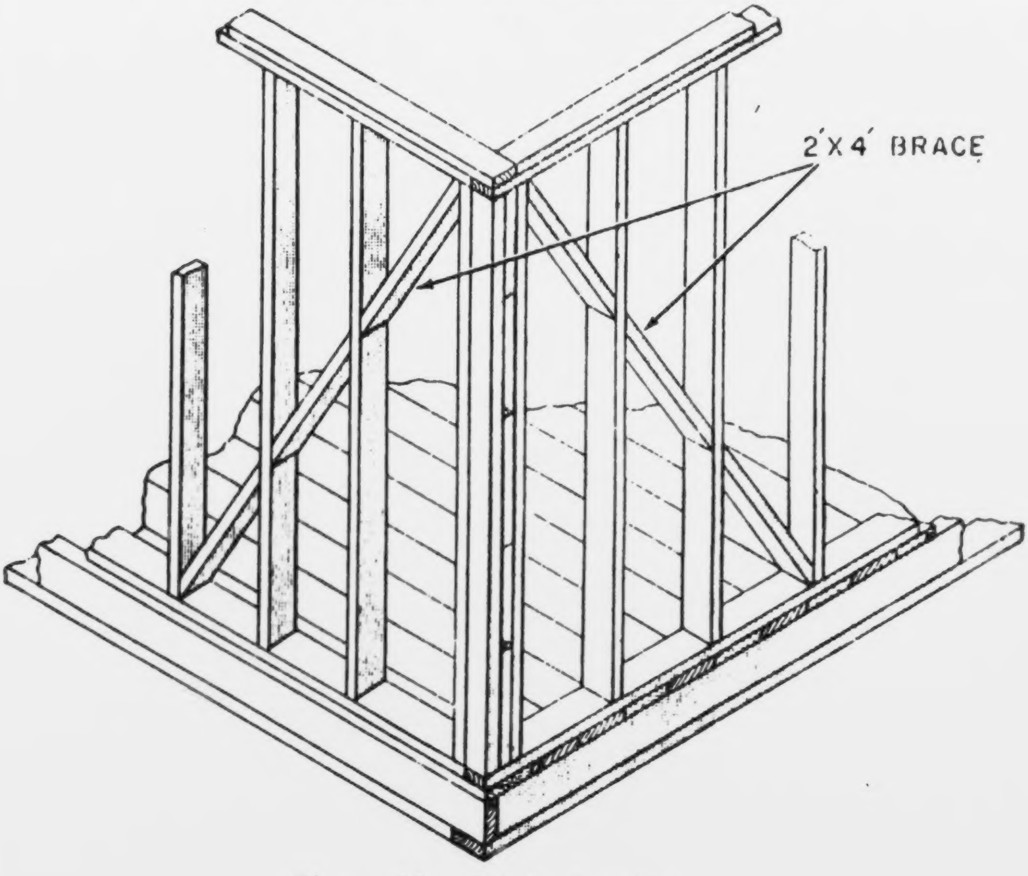
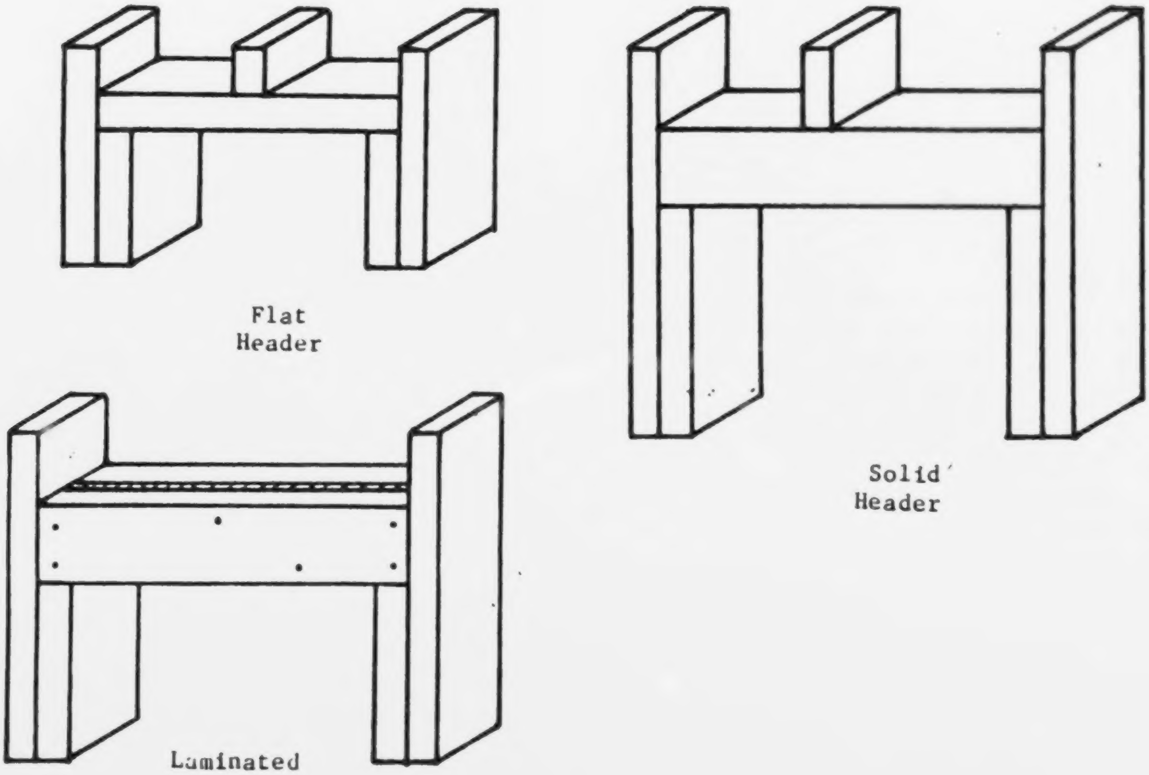


Figure 37. Set-in Bracing



Flat Header

Solid Header

Laminated Header

Figure 38. Types of Headers

In non-loadbearing walls with openings of 3' or less a flat header may be used. A flat header is a single 2 X 4, laid flat on the trimmers. Loadbearing walls require either a solid or laminated header with the size of header determined by the span of the opening and the load it must carry.

When building studs are constructed out of 2 X 4s a solid header may be a 4 X 4, 4 X 6, 4 X 8, etc., depending on the requirements of the opening. Laminated headers are constructed by securing two pieces of 2 inch material together with a 1/2" thick strip of filler material between them. Use 16d nails.

Headers are secured to the king post by toenailing through the top of the header into the stud, this drives the header tight against the trimmer and buttnailing through the common stud into the header with 16d nails.

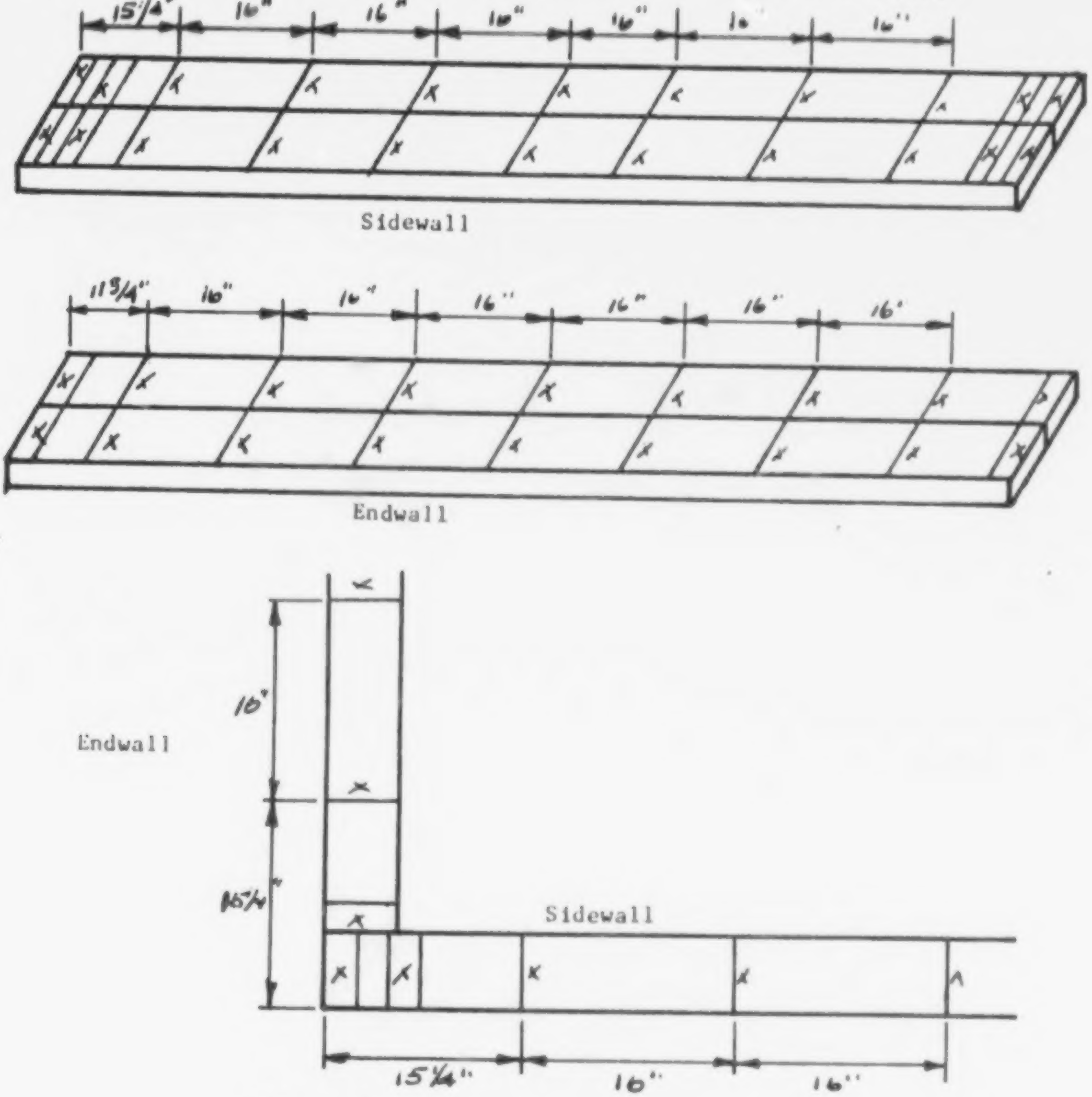

15¼"
16"
16"
16"
16"
16"
16"
Sidewall
11¾"
16"
16"
16"
16"
16"
16"
Endwall
16"
15¼"
Endwall
Sidewall
15¼"
16"
16"

Figure 39. Plate Layout - Combined View

WALL LAYOUT

Figure 39 illustrates a completed plate layout. This layout includes common studs, a built-up corner, cripple studs, trimmers and a partition post. When laying out a wall it is important that all studs are properly laid out, this insures the studs will be in vertical alignment and on the proper centers.

Layout of the studs for opposite walls must be accomplished from the same direction, this maintains the correct stud support for rafter alignment. Layout is performed on the face side of the plate material and should be accomplished on the sole plate and top plate at the same time.

To begin layout procedures, cut all plate material to length, remember that all joints in the plates should be centered on a stud. Position the sole plate and top plate edge to edge and layout for the common studs.

1. Layout the built-up corner post on both ends of the side walls. This is the equivalent of three stud thicknesses.

2. Layout the first stud for 16 inch O.C., the layout mark on side walls is at 15 1/4 inches, for end walls it is 11 3/4" from the end of the end end wall plate material. This places all studs 16" O.C. from the outside edge of the walls.

3. The rest of the studs will be laid out every 16 inches from the first study. Figure 39 illustrates a combined view of stud layout.

After the common studs are laid out the doors, windows and partitions are laid out. Door and window positions are measured from the center of the opening and partitions are positioned according to the center of the intersecting wall.

Doors and windows require a framed opening larger than the unit being installed. The framed opening is called the rough opening (R.O.). The amount of the opening which is greater than the door or window size is called the framing allowance. For door installation a standard framing allowance of 2 1/2" is used, the framing allowance for windows depends upon the type and design of the window and should be installed according to manufacturer's specifications. Once the framing allowance and rough opening is known, the doors, windows and partitions are laid out (Figure 40).

1. To layout for doors, windows and partitions, determine the center point of each and mark this position on the sole plate and top plate.

2. To determine the positions of the trimmers, divide the R.O. by 2. Measure this distance from the center mark of the opening and layout the trimmers.

3. All common studs which fall within this area should be remarked as cripples.

4. Layout partition post.

WALL ASSEMBLY AND ERECTION

We have been discussing the components and layout of a wall, now it is time to begin assembly. There could be equally as many ways to assemble or erect wall frames as there are personality differences among people; for this reason, we will discuss two commonly used methods.

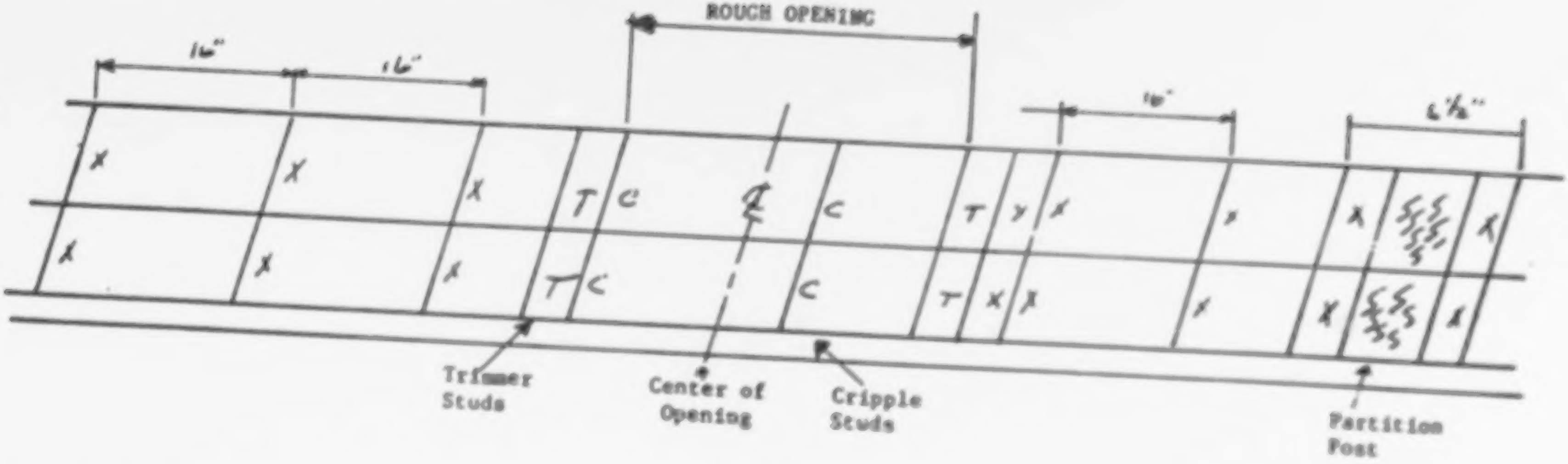

16"
16"
ROUGH OPENING
16"
6½"
X
T
C
℄
Trimmer Studs
Center of Opening
Cripple Studs
Partition Post

Figure 40. Door/Window and Partition Layout

One way to assemble and erect a wall is to fasten the sole plates to the platform, then toe-nail the studs to the plates in an upright position. In this instance, the top plate is attached to the upper part of the studs by driving nails through the plate into the studs. The top plate serves as a cap to help stiffen, align, and equally space the studs. For the most part, this method for frame assembly and erection is least desirable because of the effort it takes to erect a wall and because twice as many nails are used for toe-nailing to assure proper wall strength. This method, for example, is used when obstructions (such as walls and pipes) won't allow room enough to preassemble the wall before standing it in an upright position.

In platform and slab-on-ground construction, the subfloor can be used as a work platform. This will allow you to assemble walls by sections and then raise them into a vertical position as a unit.

To assemble a wall section in this manner, turn both plates (previously laid out) on edge with the layout marks inward. Separate the plates approximately the distance of the stud length and lay studs at the marks indicating common stud locations. Nail the top plate and sole plate to each stud using two 16d common nails at each end.

Once you have nailed the common study to the sole plate and top plate, you can go back and nail any trimmers, headers, roughsills, and cripple studs to fill the spaces between the common studs, or the trimmer/stud combination may be secured to the header and placed in position as a complete unit.

The side walls are normally raised first aligned to the edge of the subfloor and floor joist and secured to the subfloor and joist with 20d nails. The walls are then vertically aligned and squared and held in place by temporary bracing (Figure 41).

The side walls are normally raised first aligned to the edge of the subfloor and floor joist and secured to the subfloor and joist with 20d nails. The walls are then vertically aligned and squared and held in place by temporary bracing (Figure 41).

You can vertically align a wall section by several different tools and methods. A framing square, with the tongue lying on the sole plate and the blade against the side of the corner post, will align the corner to 90° with the horizontal plate. Remember, you must check in both directions from the corner. By centering the end bubble of a common level held against the side of a corner post, you can bring it to a vertical position. If the wind is not blowing, a plumb bob can be used. Hang the plumb bob from the top plate so that the point is just above the sole plate. When the corner is vertically aligned, the point where the string is attached and the plumb bob are an equal distance from the corner post. A more accurate method is to use the 3-4-5 rule you learned in squaring building corners in Chapter 1. Measure and mark two points - on the corner post, 3 feet from the bottom and on the sole plate, 4 feet from the corner post. If the corner post is in a true vertical position the distance between these points will be 5 feet. For more accuracy, these distances can be doubled, i.e., 6-8-10.

After the side walls are plumbed, squared and braced the end walls may be set in place. If the side walls were properly erected the end walls should fit snug, be plumb and squared. The endwalls are secured with 20 nails at the sole plate and with 10d nails 12" O.C. at the corner post. The double top plate is installed next with all joints a minimum of four feet away from top plate joints. The DTP is secured with 10d nails 16" O.C.

Fire blocks are installed next with special attention paid to the point where set-in wind bracing will intersect. This piece of fire blocking should be left out and later fitted around the set-in bracing. Windbracing is installed after the fire blocking is completed.

Ceiling joists are installed after the bracing is completed. Ceiling joists carry the ceiling material and help prevent the walls from spreading. When installed as a floor frame for the second story, the procedures for installation described earlier should be followed. If installed on the same level as the rafters, the header is left out, lighter material is normally used and the ends are sloped according to the roof slope (Figure 42).

Ceiling joists will normally run across the width of the structure, but may alternate directions, if this will decrease their span. Ceiling joists bear surface on the double top plate and to one side of the stud, this allows the rafters to be placed over the studs. They may be secured by metal hangers or toenailed thru the end with one 16d nail and toenailed on the sides with two 8d nails on each side.

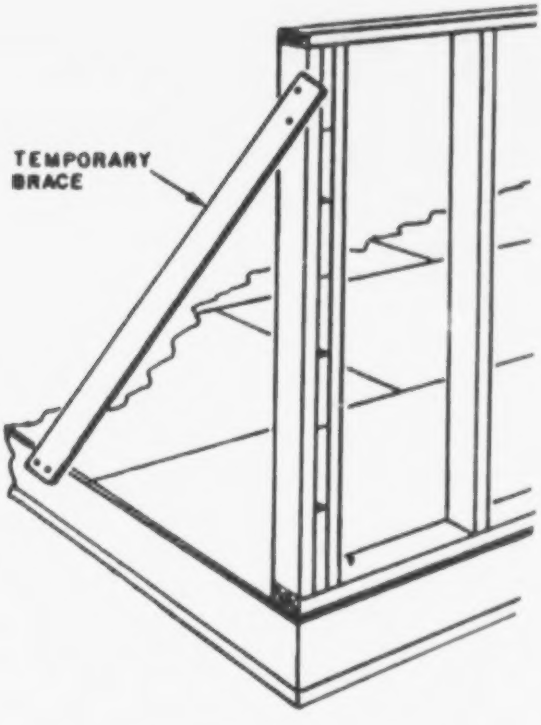


Figure 41. A Wall Frame Assembled on the Floor, Then Raised into Place

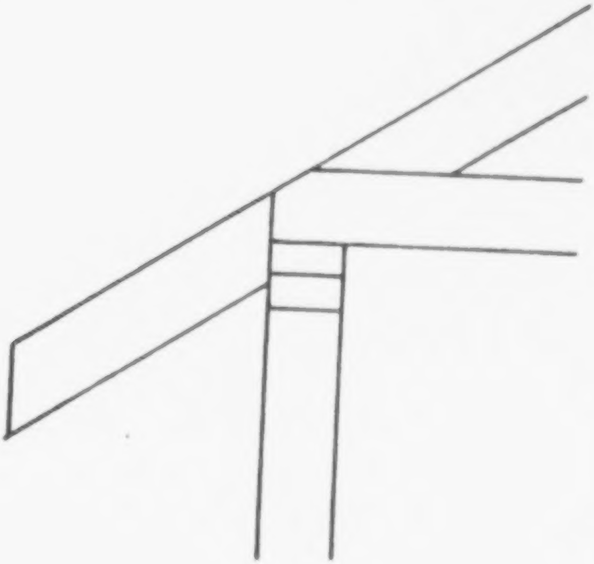


Figure 42. Ceiling Joist Cut to Roof's Slope

SUMMARY

Framing a structure may appear to a novice as an extremely difficult task. But once the basics are known and understood the framing of a structure may be accomplished with skill and ease.

QUESTIONS

A. Complete the following and answer the questions.

1. What is the framing member that is secured directly to the foundation wall?

2. Girders are supported by piers, columns, and foundation walls and require a minimum bearing surface of _________ inches.

3. How far apart (on center) are floor joists installed, when extreme loads are expected?

4. Joists which run the width of the structure are known as __________ joists.

5. Which joists frame the inside of floor openings and are parallel to common joist?

6. In platform construction, joists are normally laid out on the ______________________________.

7. How many joists are required for a 12 X 16 building?

8. ___________________ is used to stiffen the floor frame and help distribute the load placed on the floor.

9. What type of bridging is located between the joist and over girders?

10. When installing plywood subflooring the long dimension of the plywood is installed at __________ __________ to the common joists.

11. The ends of end matched tongue and groove flooring (do/do not) have to fall over a joist.

12. What is the bottom plate of a wall called?

13. Vertical members of exterior walls and partitions are called

_______ __________.

14. Shortened common studs are known as ______________ studs.

15. Diagonal wall bracing may be installed in the wall at angles ranging

from ______________° to ________________°.

16. Wind bracing made from the same material as the studs and cut to fit

between the studs is called _____________ ______________ wind bracing.

17. How far above the subfloor is fire blocking installed?

18. The horizontal framing member that carries the load over doors and

windows is called a/an _________________________.

19. The opening which is framed for doors and windows and includes a

framing allowance is called a/an _______________________.

20. _______________ _________________ carry the ceiling material and help prevent the walls from spreading.

B. Answer questions 1-20 at the end of Unit 7.

C. Answer questions 1-14 at the end of Unit 8. Omit questions 11 and 13.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-III-3

SCAFFOLD CONSTRUCTION

OBJECTIVE

Given procedures, equipment, materials and working as a member of a team construct, erect, and remove scaffolding with no more than four instructor assists.

INTRODUCTION

A large part of your work will be done from a scaffold. Serious accidents have been caused by carpenters who use a scaffold that was not properly erected or used. A scaffold that was not erected properly not only endangers the workers who use it, but could be a serious danger to people who walk or work near it.

INFORMATION

SCAFFOLDS

There are many types of scaffolds that the carpenter uses. Some of them are made of wood and some are made of metal. The ones you will use and erect include the scaffold horse, the sectional steel scaffold, and the aluminum stairway scaffold.

Scaffold Horse

A pair of scaffold horses with boards placed on them make a very useful scaffold. It is erected quickly and can be easily moved as the work progresses. The use of this type of scaffold is limited to the height of the scaffold horse.

Figure 43 shows a pair of scaffold horses with two scaffold boards. Always use at least two boards to form a platform on any scaffold. These boards should be a minimum of 1 1/2 inches thick and 9 1/2 inches wide. You can use an extension plank, as shown in figure 44, in place of the scaffold board.

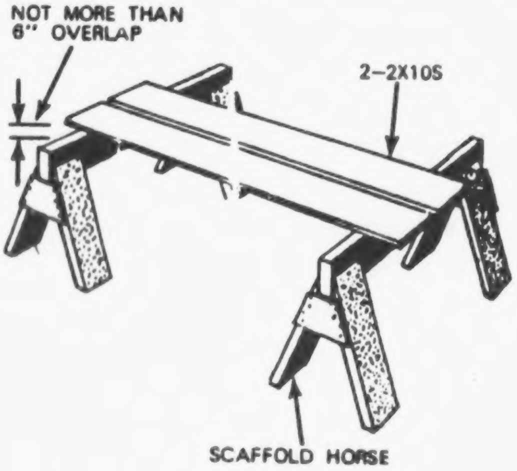


Figure 43. A Horse Scaffold

Sectional Steel Scaffold

The most popular and safest scaffold for the carpenter is the sectional steel scaffold. It is strong and easily assembled. It will hold heavy loads, such as you will use when laying concrete blocks or bricks.

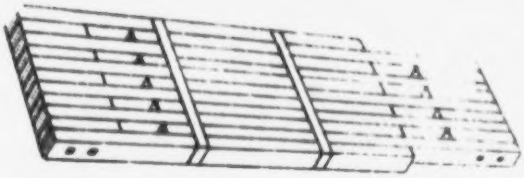


Figure 44. An Extension Plank

Aluminum Stairway Scaffold

Another popular type of scaffold is the aluminum stairway scaffold, as shown in figure 45. The sections of this type of scaffold unfold. You can erect the aluminum stairway scaffold quickly and easily, but it is limited to lighter loads than those possible with the sectional steel scaffold. It is used for light jobs, such as cleaning brickwork.

ERECTION OF SCAFFOLDS

To do your job you need to erect the scaffold horse, sectional steel scaffolds, and the aluminum stairway scaffold.

Scaffold Horse

A scaffold using scaffold horses is the easiest scaffold to erect. Place the horses on even footing and lay two scaffold boards (2 X 10s or larger) or an extension plank on top of them. The scaffold is ready to use.

Sectional Steel Scaffold

The sectional steel scaffold is erected by taking the following steps: (1) set the footing plates, as shown in figure 46 on firm even ground or on a board to support the weight of the scaffold, (2) insert a leveling jack, as shown in figure 47, into each footing plate, (3) install two panels into the leveling jacks which were installed into the footing plates, as shown in 48, (4) have helpers steady the panels while you attach "X" type pivoted braces, as shown in figure 49.

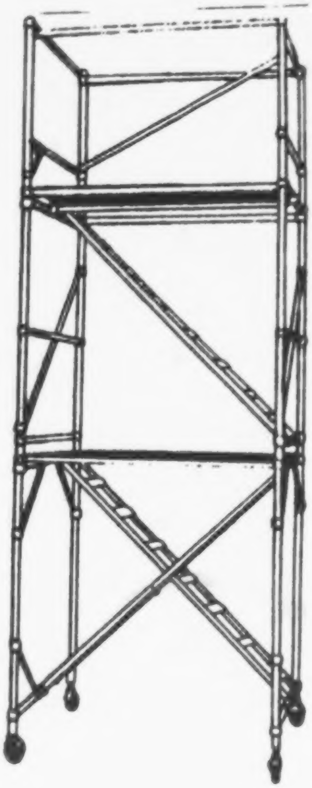


Figure 45. Aluminum Stairway Scaffold

After the braces are attached, you have one basic unit, (5) additional units can be installed until you have a scaffold as long and as tall as you need. Figure 50 shows an erected scaffold. The upright legs of the scaffold are held securely by couplings. One type is shown in figure 51. Spring-loaded pins in the coupling atuomatically lock the sections together, (6) sectional steel scaffolding can be constructed as high as required, but scaffolding over three sections high must be secured to the structure. One method of fastening it to the structure is shown in figure 52. The top section must always be equipped with a guardrail and toeboard. The guardrail prevents workmen from falling and the toeboard keeps tools and materials from falling on other workmen below, (7) side brackets, as shown in figure 53 can be attached to the inside of the scaffold to support workmen. The scaffold can then be used to hold materials, (8) if the scaffold is to be used on a solid floor and frequent moving is necessary, a rolling tower can be constructed of the same scaffold sections by replacing the footing plates with locking casters. The height of the tower must not exceed four times the smallest base dimensions, and it must be equipped with a toeboard and a guardrail above the working platform.

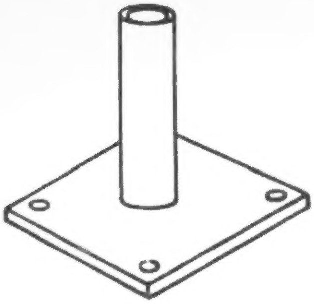


Figure 46. Scaffold Footing Plate

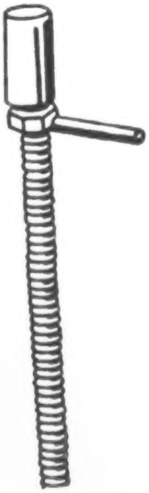


Figure 47. Leveling Jack

Aluminum Stairway Scaffold

This type of scaffold is erected by taking the following stepss: (1) place the adjustable section on the ground with the stairway treads facing up. Swing the top end frame over through 270° until you can snap the hooks at the bottom of the stairway over the lower crossbar, as shown in figures 54 and 55, (2) lift the opposite end until the end frame is vertical and the folding V-braces are locked. Figure 57 shows how the spring-actuated latches look when they are unlocked and when they are locked. Do not use the scaffold if any of these latches are not operating properly, (4) level the scaffold by operating the leg adjustment, as shown in figure 58. Never use a scaffold unless the leg adjustment is in perfect working order, (5) before climbing the

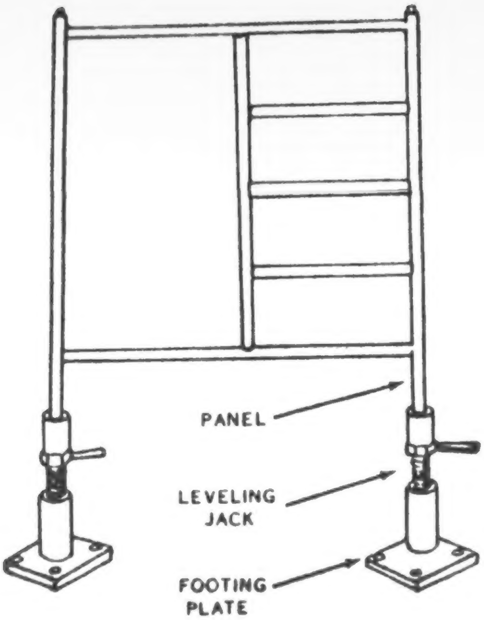


Figure 48. Install Leveling Jacks and Panels into Footing Plates

ladder, lock all caster brakes as shown in figure 59. Never roll the scaffold with anyone on it. Pushing the locking level down sets the caster brake and moves the wheel to dead center position for maximum scaffold rigidity. The greater the load on the scaffold, the greater braking action, (6) place the next section against the top of the stairway of the bottom section, as shown in figure 60. The stairway treads on this second section should face out, (7) climb the scaffold and pull the second section up. Swing the top end frame through 270°, as shown in figures 61 an 62. Slip the lower crossbar under the stairway and straddle the floor braces of the lower section, (8) raise the other end by pulling on the floor braces until the other end frame becomes vertical. Slip the legs of the frames into the sockets and lock the stairway hooks into position, as shown in figures 63 and 64. Place the plywood platform over the locating pins on the supporting tubes, (9) as each section is installed, move the interlock clips up to the locking holes. Figure 65 shows the interlock clip. It also shows the clip in the locked position and the stored position, (10 place the folded half section of safety railing on top. Unfold the end frame through 270°, as shown in figure 66 and slip the end frame into the sockets, (11) snap the diagonal brace into position, as shown in figure 67. Place an additional plywood platform over the stairway opening if the additional working area is needed.

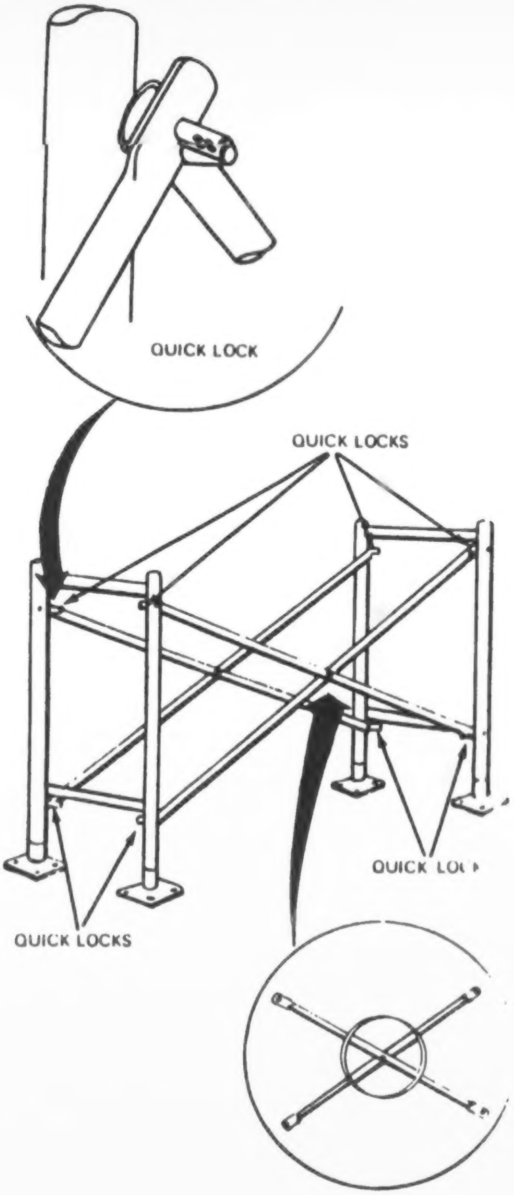

QUICK LOCK
QUICK LOCKS
QUICK LOC
QUICK LOCKS

Figure 49. Installing Braces

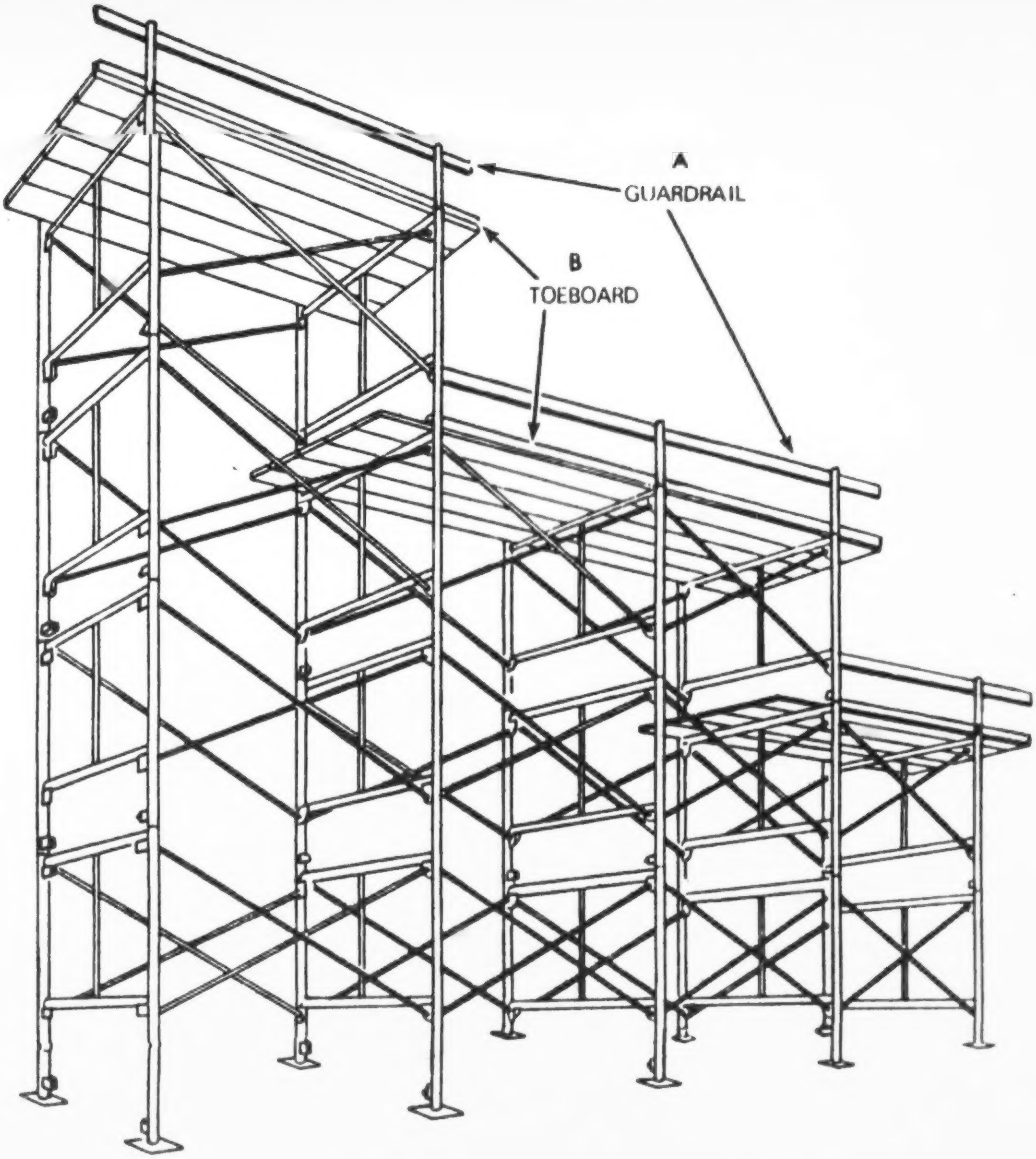

A
GUARDRAIL
B
TOEBOARD

Figure 50. an Erected Scaffold

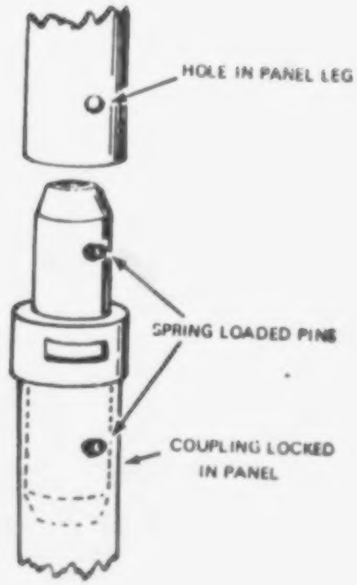

HOLE IN PANEL LEG
SPRING LOADED PINS
COUPLING LOCKED IN PANEL

Figure 51. Coupling

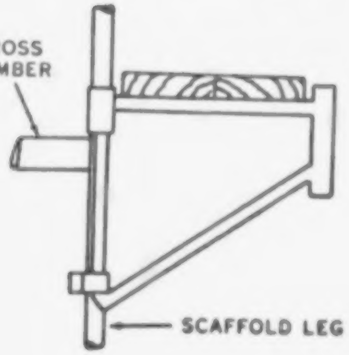

CROSS MEMBER
SCAFFOLD LEG

Figure 53. Side Bracket

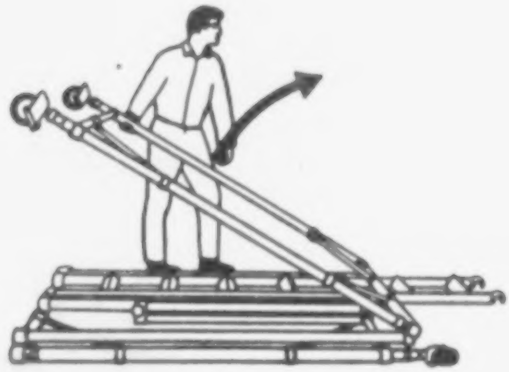


Figure 54. Swing the End Frame 270°

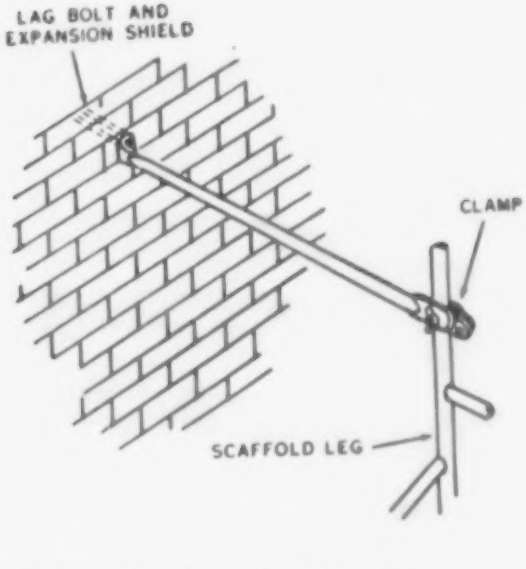

LAG BOLT AND EXPANSION SHIELD
CLAMP
SCAFFOLD LEG

Figure 52. Building Tie-in

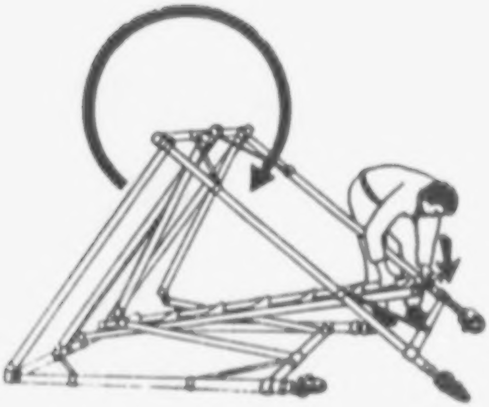


Figure 55. Snap the Lower Crossbar into the Stairway Hooks

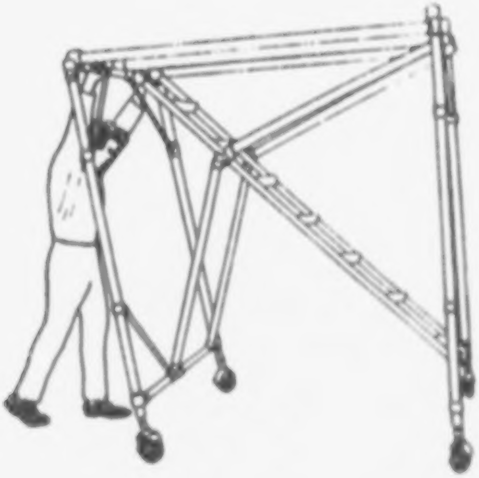
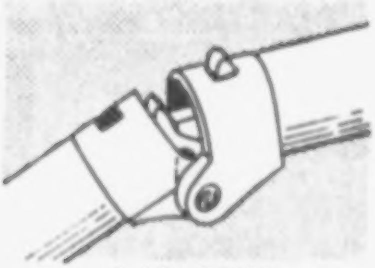
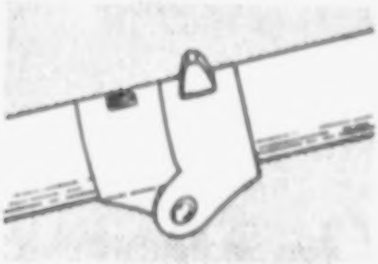


Figure 56. Lift the Opposite End

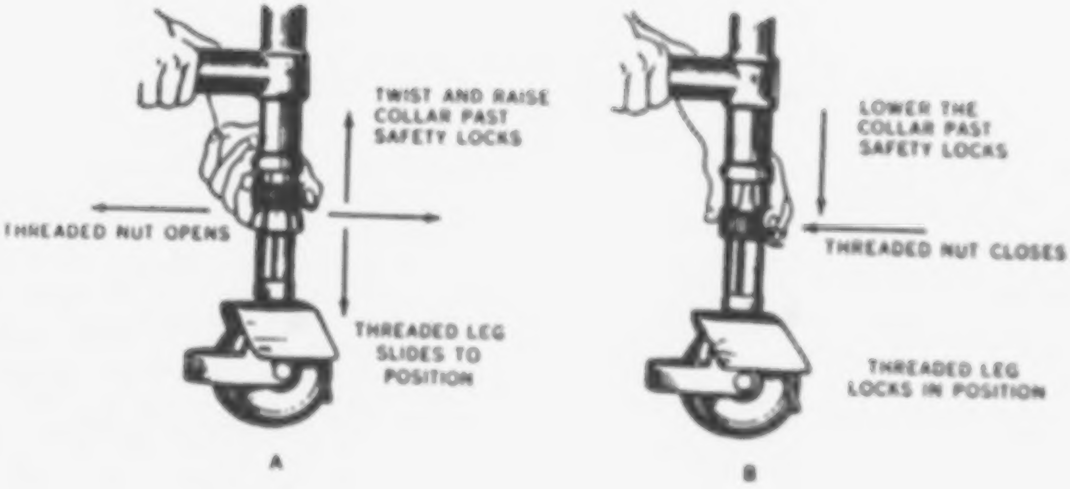


A. UNLOCKED



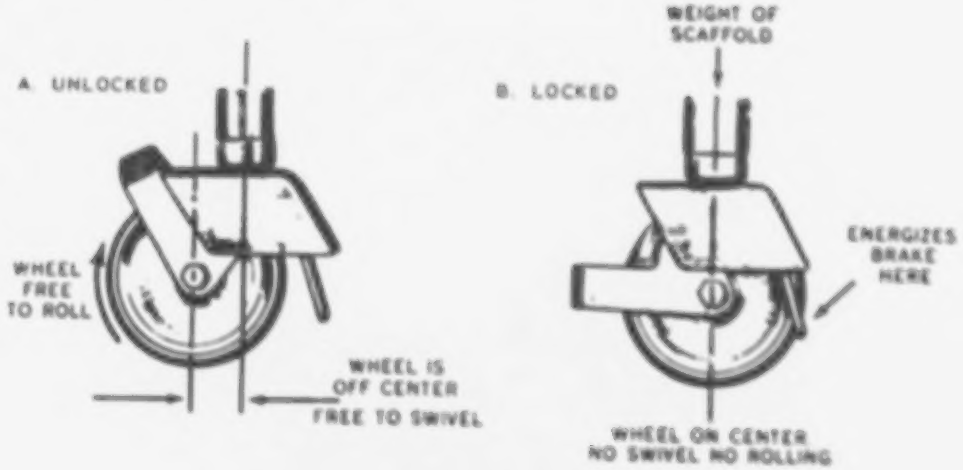
B. LOCKED

Figure 57. Make Sure Latches are Locked



TWIST AND RAISE COLLAR PAST SAFETY LOCKS
THREADED NUT OPENS
THREADED LEG SLIDES TO POSITION
A
LOWER THE COLLAR PAST SAFETY LOCKS
THREADED NUT CLOSES
THREADED LEG LOCKS IN POSITION
B

Figure 58. Level the Scaffold



A. UNLOCKED
WHEEL FREE TO ROLL
WHEEL IS OFF CENTER
FREE TO SWIVEL
B. LOCKED
WEIGHT OF SCAFFOLD
ENERGIZES BRAKE HERE
WHEEL ON CENTER NO SWIVEL NO ROLLING

Figure 59. Lock the Caster Brakes

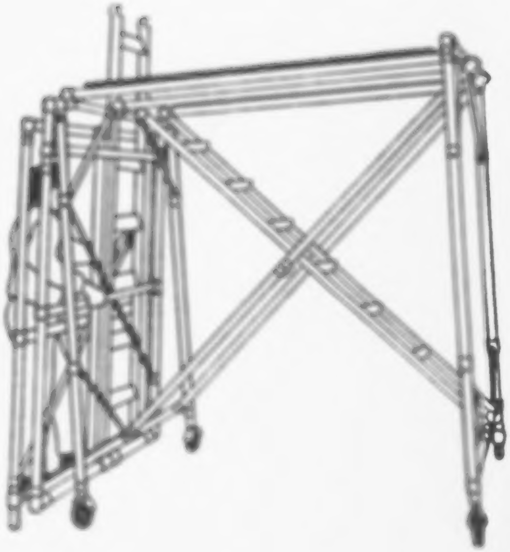


Figure 60. Raising the Second Section

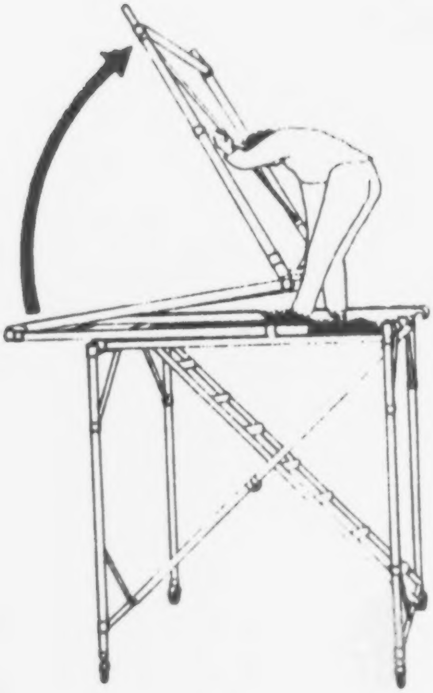


Figure 61. Raise the Top End Frame

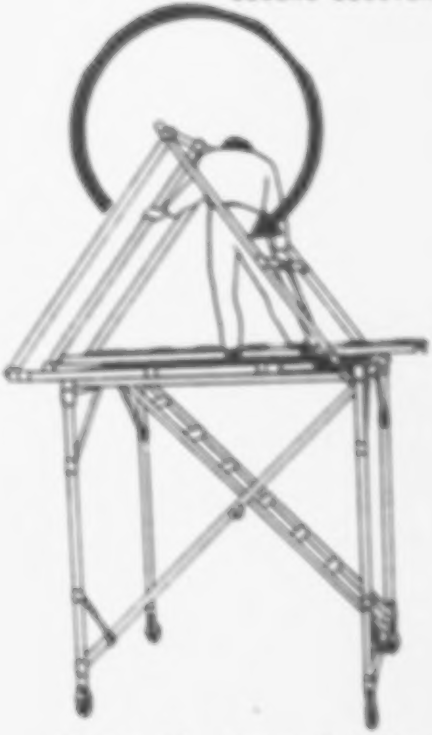


Figure 62. Swing the Top End Frame Through 270°

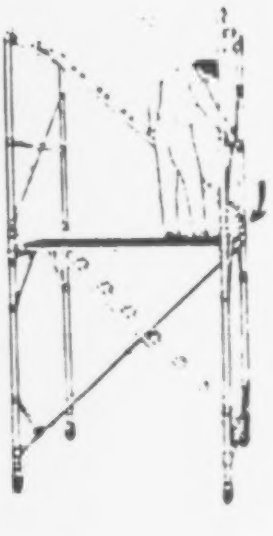


Figure 64. Lock the Stairway Hooks

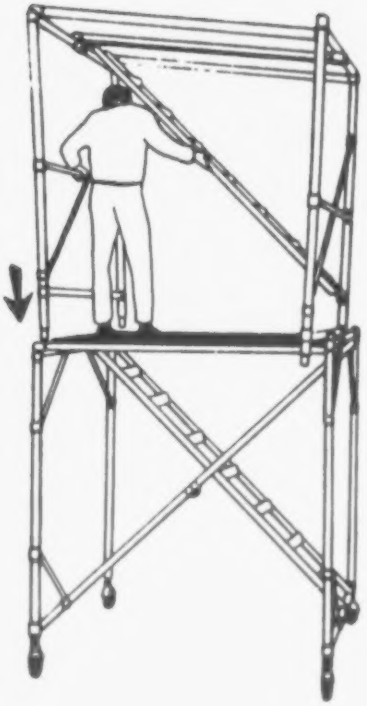


Figure 63. Raise the Other End and Slip the Legs into the Sockets

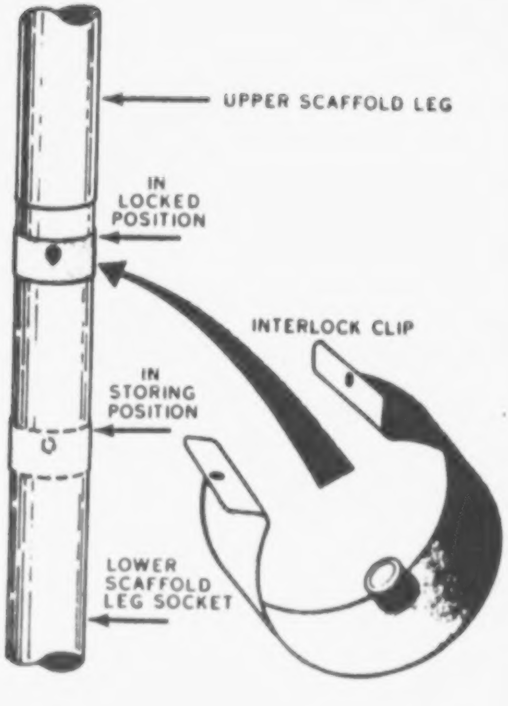

UPPER SCAFFOLD LEG
IN LOCKED POSITION
INTERLOCK CLIP
IN STORING POSITION
LOWER SCAFFOLD LEG SOCKET

Figure 65. Move the Interlocked Clip into Locking Position

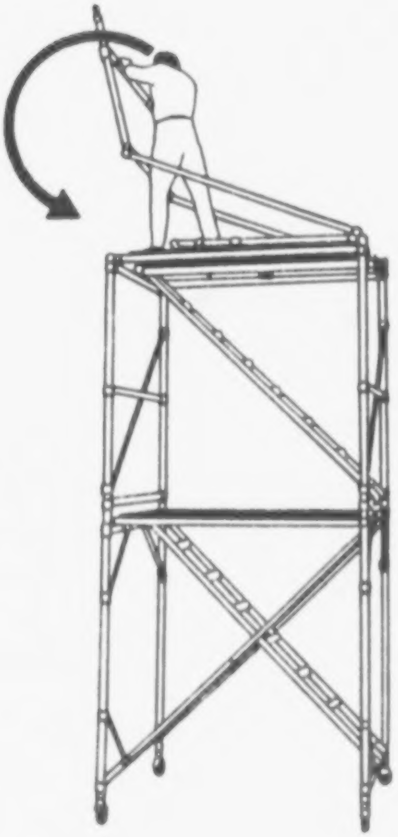


Figure 66. Unfold Longer End Frame of Stairway Railing Through 270°

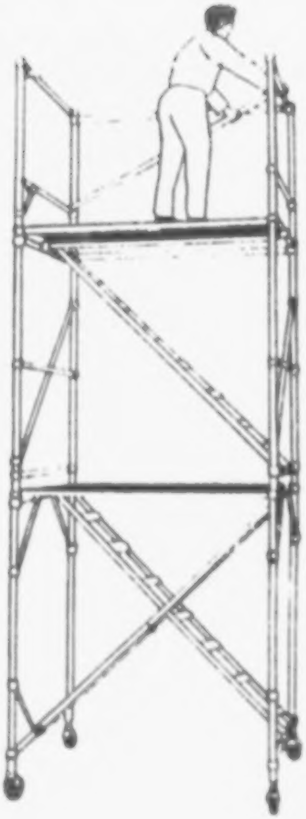


Figure 67. Place Ends into Sockets and Lock Diagonal Brace

SCAFFOLD SAFETY

A large part of your work will be done from a scaffold. Serious accidents have been caused by carpenters using scaffolds which were erected or used imporperly. A scaffold which has been erected improperly not only endangers the workers using it, but could become a serious danger to people who work near it. The following safety precautions for the scaffold horse, sectional steel scaffold, and the aluminum stairway scaffold are not all-inclusive and are not designed to replace other safety precautionary measures.

Scaffold Horse.

Although scaffolds constructed by using scaffold horses are not very high from the ground, there are several precautions to take to prevent serious injury to yourself or others. Some of the precautions to take are as follows:

1. Inspect the scaffold horses for split members, loose knots, and bad nailing.
2. Set the scaffold horses on firm even footing for each leg.
3. Test scaffold boards before using by jumping on them, as shown in figure 68.
4. Never use a scaffold board for masonry work that is not a minimum size of 1 1/2 X 9 1/2 inches (2 X 10).
5. Place the boards close together on the horses.
6. Do not overload the scaffold.

Sectional Steel Scaffold

The sectional steel scaffold is the safest scaffold for a carpenter to use. It will hold heavy loads when it is necessary. Some safety precautions to take while working from the sectional steel scaffold are as follows:

1. Inspect all scaffolds before using--never use any equipment that is damaged or deteriorated in any way.
2. Keep all equipment in good repair. Avoid using rusted equipment--the strength of rusted equipment is not known.

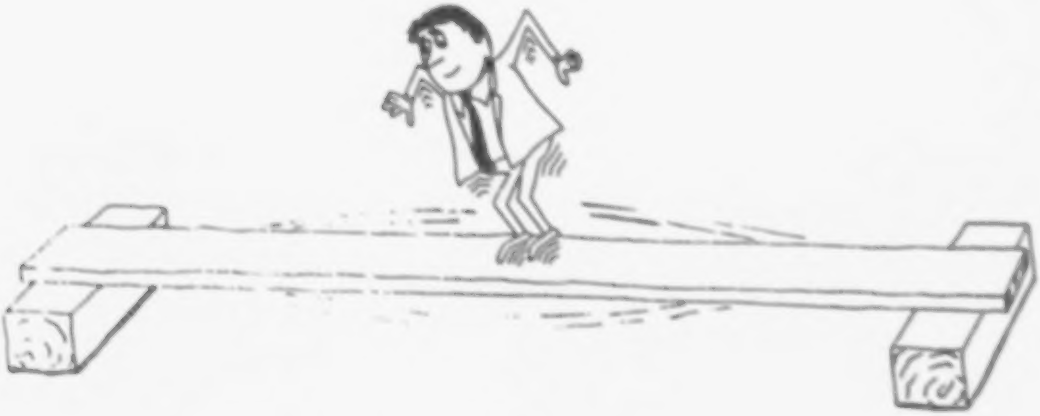


Figure 68. Testing a Scaffold Board

3. Inspect erected scaffolds regularly to be sure that they are maintained in safe condition.

4. Provide adequate support for scaffold posts and use base plates.

5. Use leveling jacks instead of blocking to adjust to uneven grade conditions.

6. Plumb and level all scaffolds as the erection proceeds. Do not force braces to fit--level the scaffold until a proper fit can be made easily.

7. Fasten all braces securely.

8. Do not climb cross braces.

9. On wall scaffolds place and maintain tie-ins securely between structure and scaffold at least every 30 feet of length and each 26 feet in height.

10. Equip all planked or stayed areas with proper guardrails and toeboards.

11. Do not erect steel scaffolds near power lines.

12. Do not use ladders or makeshift devices on top of scaffolds to increase the height.

13. Do not overload scaffolds.

14. Use only lumber that is properly inspected and graded as scaffold plank.

15. Planking must have at least 12 inches of overlap and extend 6 inches beyond center of support, or be cleated at both ends to prevent sliding off supports.

16. Do not allow unsupported ends of plank to extend an unsafe distance beyond supports.

17. Secure plank to scaffold when necessary.

18. For rolling scaffold the following additional rules apply:

    ° Do not ride rolling scaffolds.

    ° Remove all material and equipment from platform before moving scaffold.

    ° Caster brakes must be applied at all times when scaffolds are not being moved.

- Casters with plain stems must be attached to the panel or adjustment screw by pins or other suitable means.

- Do not attempt to move a rolling scaffold without sufficient help--watch out for holes in floor and overhead obstructions.

- Do not extend adjusting screws on rolling scaffolds more than 12 inches.

- Do not use brackets on rolling scaffolds without consideration of overturning effect.

- The working platform height of a rolling scaffold must not exceed four times the smallest base dimension unless the scaffold is guyed or other wise stabilized.

Aluminum Stairway Scaffold

Here are some safety rules that apply to aluminum stairway scaffolds.

1. Apply all caster brakes before climbing the scaffold.

2. Never move a scaffold when anyone (or any material) is on it.

3. Be sure the scaffold is level at all time. When a leg is adjusted, be sure to push the locking collar completely over the expanding nut and below the safety locks. Never make leg adjustments when anyone is on the scaffold.

4. Don't try to "stretch" the platform height with the adjustable legs. When additional height is required, add more scaffold sections. Save the leg adjustment for leveling the scaffold.

5. Do not lean a ladder against a stairway scaffold or place a ladder on the platform of a scaffold. Never push or pull or lean against the wall or ceiling when standing or sitting on a scaffold, unless it is securely tied in to the building.

6. Make sure all locking hooks are firmly in position. These hooks appear at each end of separate horizontal and diagonal braces and at the lower end of stairways.

7. Before using a scaffold with folding braces, be sure that the latches of all locking hinges are locked.

8. Always install a safety railing and toeboard when a platform is to be used at heights of 4 feet or over.

9. When the height of an aluminum stairway scaffold platform is going to exceed three times the minimum base dimension, the scaffold must be tied in to the building.

10. Do not climb or stand on diagonal braces. Work only while standing on one of the platforms.

11. Never use a scaffold of any type in the vicinity of live electrical apparatus or near machinery that is in operation.

12. The columns of each scaffold section are furnished with interlock clips parked in the lower of a pair of holes at the upper ends. As an upper section is inserted, the interlock clips of the section below are moved to the upper section bushings, interlocking the two sections. Never erect a scaffold without interlocking the sections in this manner. If interlock clips are damaged or lost, replace them immediately.

13. Never use stairways to work from; they are for personnel to walk up and down between platforms. Stairways are designed to take the weight of a 200-pound man. They are not designed to take excessive loads or abuse.

14. Never climb up the outside of a stairway scaffold. Always use the stairway for access.

15. The platform of the stairway scaffold must always be located on the floor braces by means of four locating pins. When being used outdoors or whenever the scaffold is exposed to wind or updrafts, the platform must be tied down and the scaffold secured to the building.

16. The platform of the stairway scaffold is designed to carry a maximum distributed load of 750 pounds. Do not exceed this 750-pound load.

17. When bridging between scaffolds with planks or ladder stages place the ends of such planks or stages on the scaffold platform across both floor braces to distribute the load. The other braces of the scaffold are not designed to take heavy loads. The floor braces are the thicker tubes (approximately 1/8" wall) and have vertical pins for locating plywood platforms.

18. When erecting or taking down an upper section of the scaffold, stand in the center of the platform below and keep a firm hold on the section.

SUMMARY

Scaffolds are valuable tools to the carpenter. However, extreme caution must be used when erecting and working on them. They are only as safe as you make them.

QUESTIONS

Answer questions 1 thru 7 on page 548 and 549. Use a separate sheet of paper. DO NOT write in the textbook. Return completed questions to instructor on the next class day.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-III-4

ROOF CONSTRUCTION

OBJECTIVE

Given four installed wall frames, materials, tools, equipment and working as a member of a team fabricate and install rafters and trusses on the wall frames with no more than eight instructor assists.

INTRODUCTION

The framing of a roof can be one of the most difficult jobs you find in building construction. Although roof framing does not involve many complicated details, the fitting together of the various members will be difficult if each piece is not laid out and cut to the exact size. It is important that you be able to identify and know how to frame these parts properly to provide a roof that will serve the purpose for which it is intended.

INFORMATION

RAFTER (Roof) TERMS

Roof construction requires the use of terminology all its own. You must learn and understand these names, or terms, before you can proceed with the framing of a roof. You will have a better understanding of these terms later, but the initial discussion of their meanings at this time will help you learn the procedures for roof framing.

Ridge

The ridge is the highest horizontal roof member that helps to align the rafters and tie them together at the upper end. The board used to form the ridge may be of 1- or 2-inch finished lumber. In most cases, it is equal to or wider than the cut on the end of the rafter. A 1- x 6-inch board, for example, would be sufficient for a gable roof constructed of 2- x 4-inch rafters. At any rate, the rafter should be seated fully against the ridge plate as illustrated in figure 69.

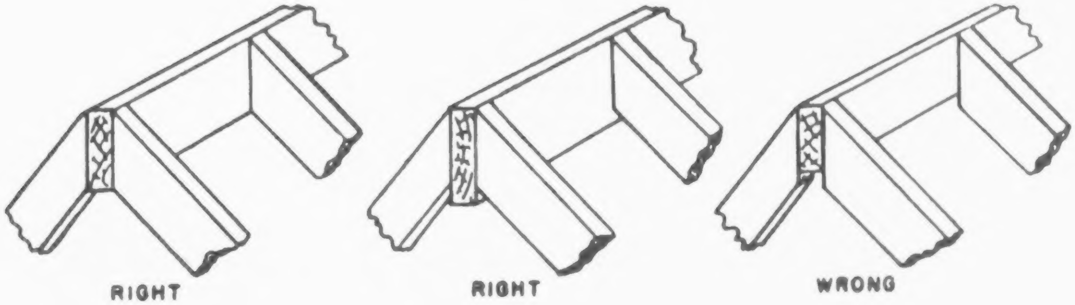

RIGHT
RIGHT
WRONG

Figure 69. Selecting the Right Ridge Board

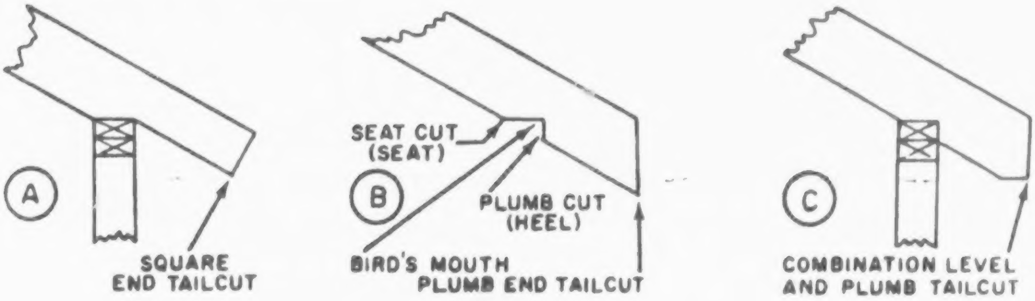

A
SQUARE END TAILCUT
SEAT CUT (SEAT)
B
PLUMB CUT (HEEL)
BIRD'S MOUTH
PLUMB END TAILCUT
C
COMBINATION LEVEL AND PLUMB TAILCUT

Figure 70. Cuts on Bottom End of Rafters

Rafter

Rafters are the sloping structural timbers of a roof designed to support the roof loads. Common rafters extend from the ridge to the plate, and form the major portion of most frame roofs. They are to a roof what the joists are to a floor and what the studs are to a wall. In the construction of roofs, different kinds of rafters are used.

Overhang (Projection)

Overhang is the horizontal distance the tail of the rafter extends beyond the edge of the structure. When laying out a rafter this amount is figured separately and added to the line length of the rafter.

Birdsmouth

The birdsmouth is the cutout near the tail of the rafter which fits over the top plate. (Figure 70). Notice the birdsmouth is composed of two cuts that allow it to intersect the double top plate. The seat cut is the horizontal cut that rests on the top of the double top plate and the plumb cut is the vertical cut which butts to the side of the double top plate.

Plumb Cut

Plumb cuts are the vertical cuts placed on the rafter. They occur at the ridge, birdsmouth, and may occur at the tail cut.

Tail Cut

The tail cut is located at the lower end of the rafter, it may be plumb angled in or out, curved or cut to meet the needs of your imagination.

Line Length

The length of the rafter from the edge of the structure to the center of the structure when following a given slope, before it is shortened to accept the ridge board, is called the line length.

Tail

The tail is the portion of the rafter which extends beyond the building.

Unit of Rise

The amount of inches the rafter rises for every unit of run.

Unit of run. 12"

Unit of span. 24"

Run. The run is 1/2 the width of the structure.

Span. The span is the width of the structure.

Total rise. Total rise is the vertical distance covered by the line length of the rafter.

Pitch

Pitch is sometimes known as the slope of a roof. It is a relationship of total rise to building span. For instance, a 1/4 pitch means the structure's span is 4 times greater than the total rise, or if the building has a 20' span the total rise is 5'.

Figure 71 and 72 list the basic terms and shows their relationship to rafter construction.

There are basically two methods to determine a rafter's length, the step off method and the rafter table method. We will cover the rafter table method for common rafters.

Looking at figure 72, we conclude that a rafter is constructed of smaller units and that each of these smaller units is part of a triangle. If we know that the unit of run is 12" and we know the unit of rise, we can determine the length of the third side. The Pythagorean Theorem states that $A^2 + B^2 = C^2$ and that $C \quad C^2$. If the unit of run is A and the unit of rise is B, then we can determine the length of the C segment of the rafter. This measurement is known as the unit of bridge measure.

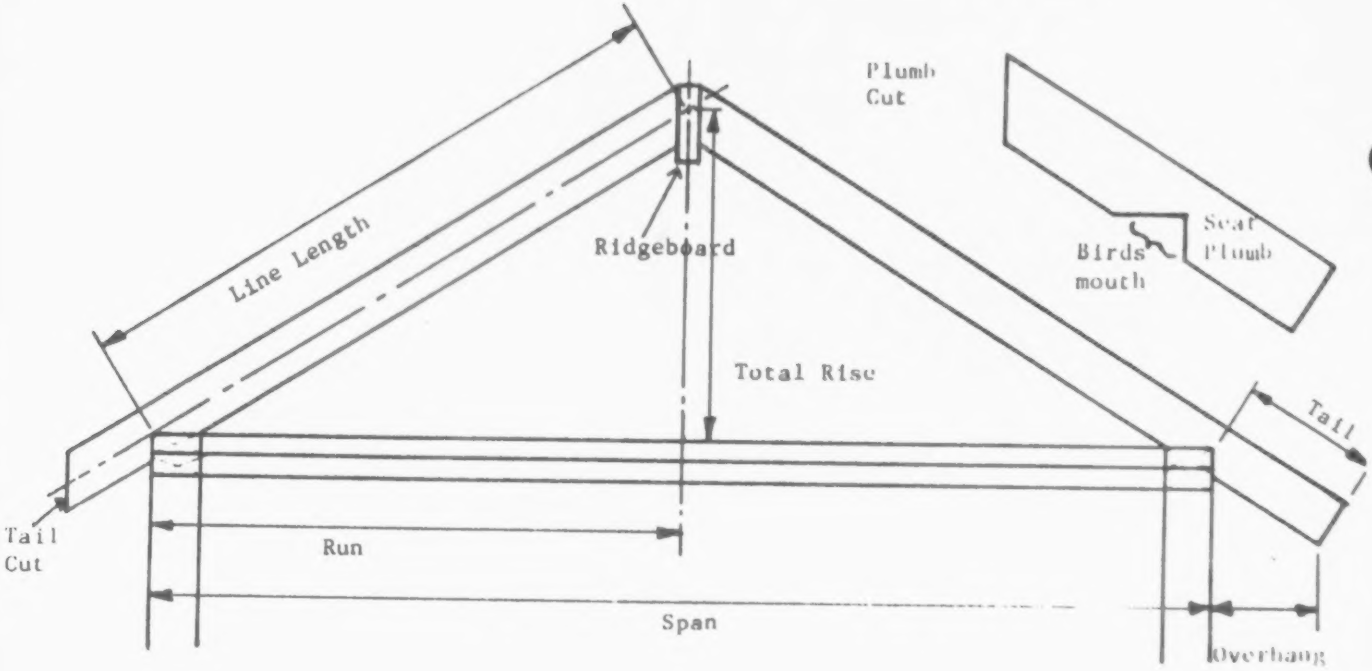

Line Length
Plumb
Cut
Ridgeboard
Seat
Birds
mouth
Plumb
Total Rise
Tail
Tail
Cut
Run
Span
Overhang

Figure 71. Rafter Nomenclature

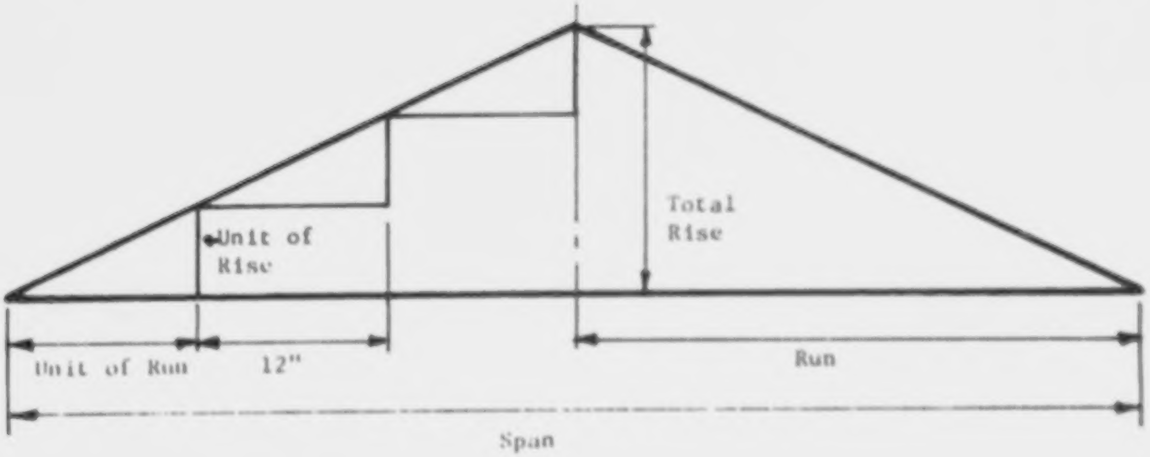


Figure 72. Rafter Basic Terms

How do we know what the unit of rise is? The unit of rise is a variable, its size will change depending on the pitch of a roof. To determine the unit of rise, multiply the pitch times the unit of span (always 24 inches). Now we stated above that we will use the unit of $rise^2$ + unit of run^2 and get the square of the unit of bridge measure. And to get the unit of bridge measure, we must take the square root. Without a sound background in geometry, this could be a difficult equation to determine. The rafter table was established to eliminate this complicated conversion. (Figure 74).

Once the unit of rise is determined (Pitch X unit of span), look at the first line of the rafter table, it will state "Length Common Rafters per Foot Run", the numbers in this line represent the unit of bridge measure and the inch markings directly above represent the unit of rise.

For example a 20 x 32 bldg with a pitch of 1/8 has a unit of rise of 3
1/8 x 24 = 3 and a unit of bridge measure of 12.37

Look at the 3 inch mark above the rafter table, on the first line directly beneath it is 12.37, this is the unit of bridge measure.

Now that the unit of bridge measure is know, multiply the run by the unit of bridge measure (Unit of bridge measure x run) and the resulting answer is the line length, in inches.

12.37 X 10 = 123.7" = 10' 3-3/4"
One hundred twenty three is converted to feet by dividing 123 by 12.

$$\begin{array}{r|l} & \;\;10' \\ \hline 12" & \;123" \\ & \;\underline{12} \\ & \;\;\;3" \text{ remainder} \end{array}$$

.7 is converted to 3/4" by rounding to the nearest 1/8" of an inch, using the chart below as a guide (Figure 73).

.125 = 1/8
.250 = 1/4
.375 = 3/8
.500 = 1.2
.625 = 5/8
.750 = 3/4
.875 = 7/8

Figure 73. 1/8" Conversion Table

Laying out the length of a rafter, using the rafter table method, requires the knowledge and use of a framing square (rafter square). The unit of rise is located on the tongue, using the appropriate inch mark for the unit of rise. Then unit of run is positioned on the body of the square, at the 12 inch mark. The rafter material should be positioned in front of the person making the layout, with the crown towards the person making the layout. The tongue is held in the left hand and the body is held in the right hand.

	23	22	21	20	19	18	17	16	6	5	4	3	2	1
Length common rafters per foot fun						2163	2081		1342	13	1265	1237	1216	
Length Hip or Valley rafters per foot run														
Diff in Length of Jacks 16 inches centers														
Diff in Length of Jacks 2 feet centers														
Side Cut of Jacks Use														
Side Cut of Hip or Valley Use														

Figure 74. Rafter Table

Begin layout at the left side of the rafter material by placing the square on the face of the stock with the unit of rise and unit of run aligned to the edge of the stock. Begin layout far enough from the ends to avoid any checks or splits located at this point. Mark the plumb cut at the tongue and measure from this point a distance equal to the line length. Reposition the square with the tongue of the square at this mark and mark for the plumb cut of the birdsmouth. (Figure 75)

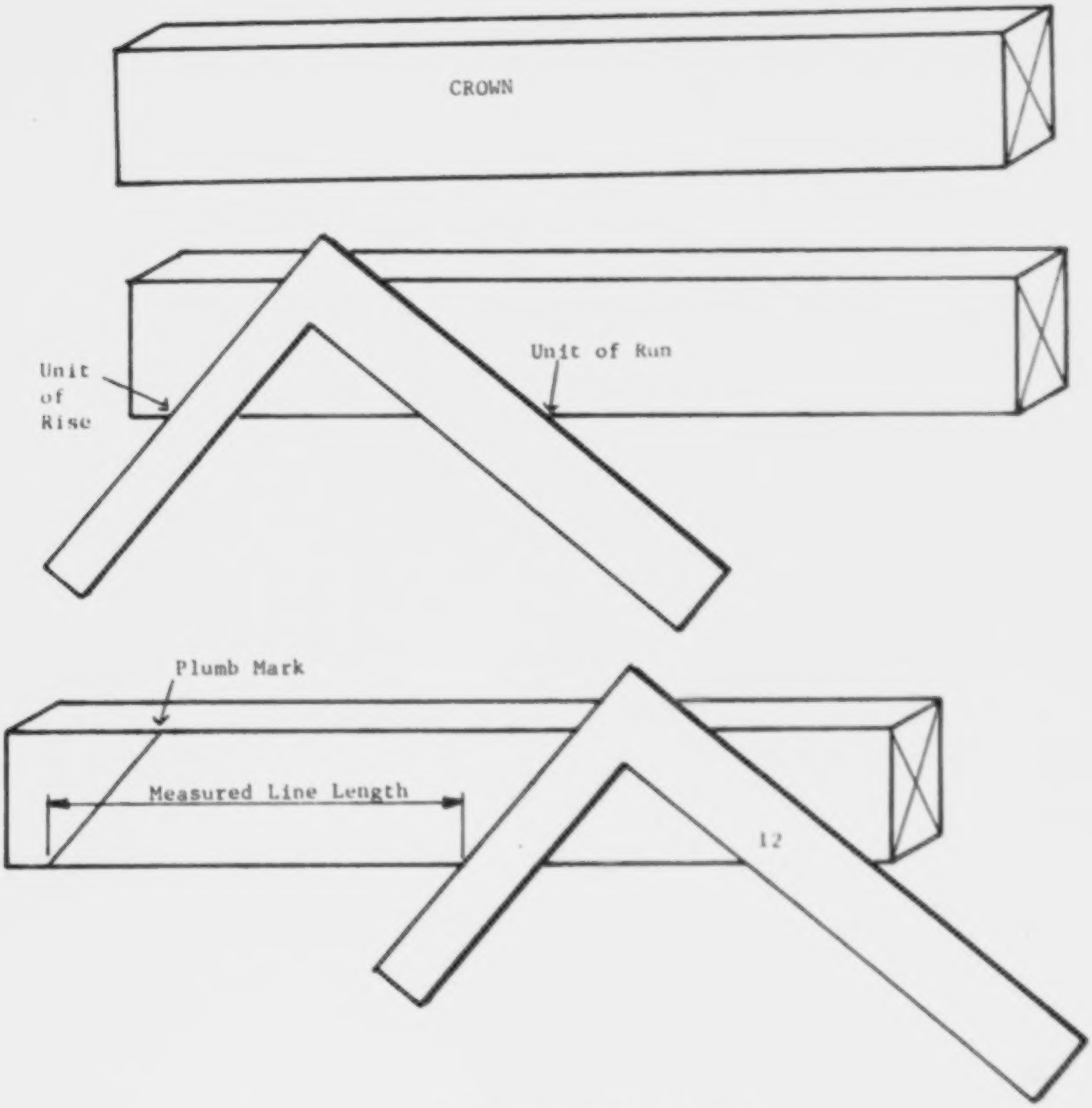

CROWN
Unit of Rise
Unit of Run
Plumb Mark
Measured Line Length
12

Figure 75. Rafter Layout

Layout for the seat cut of the birdsmouth is acomplished by measuring 1 1/2 inches from the bottom edge of the rafter along the plumb cut. The square is then moved along the face of the stock until the body of the square comes in contact with this mark, figure 66. Remember to keep the unit of rise and the unit of run aligned to the edge of the stock.

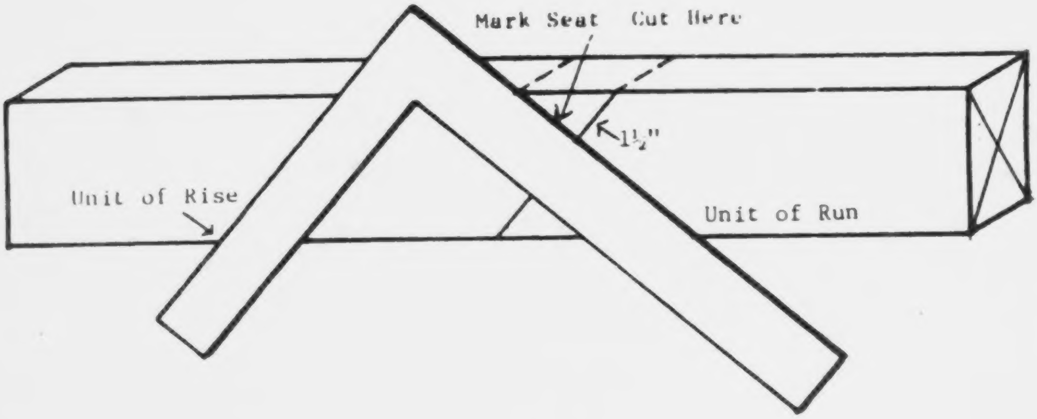


Figure 76. Laying Out Seat Cut

The tail of the rafter is laid out following the layout of the birdsmouth. Before the length of the tail is laid out, the projection needs to be known. The amount of projection will vary depending on the design of the structure and should be obtained from the blueprints.

The tail is laid out by placing the outside edge of the tongue along the plumb cut used to lay out the birdsmouth. The unit of rise and the unit of run should still be flush with the edge of the stock. Using the outside measurements of the square, measure along the body a distance equal to the projection. Make a mark at this point and slide the square until the outside edge of the tongue is flush with this mark. Check the positions of the unit of rise and the unit of run and mark the entire tail cut along the tongue of the square.

NOTE: The actual length of the tail is greater than the amount of projection.

SUMMARY

The framing of a roof is probably one of the most difficult jobs you will find in building construction. If various parts are not cut to correct length and angle, the roof will be weak, unattractive and hard to construct.

QUESTIONS

Answer questions 1 thru 16 on page 228. Use a separate sheet of paper. DO NOT write in the textbook. Return completed questions to instructor on the next class day.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-III-5

SHEATHING

OBJECTIVES

a. Given true/false statements, identify the procedures for installing wall sheathing, roof sheathing, and exterior building wall paper.

b. Given a roof frame, a wall frame, materials, tools, equipment and working as a member of a team install wall sheathing, roof sheathing, and exterior wall building paper with no more than five instructor assists.

INTRODUCTION

Wall and roof sheathing is installed after the rough framing and prior to the exterior wall coverings. It strengthens the walls and provides a nailing surface for the exterior siding. As a carpenter it is your responsibility to know the different types of sheathing and the installation procedures of each type.

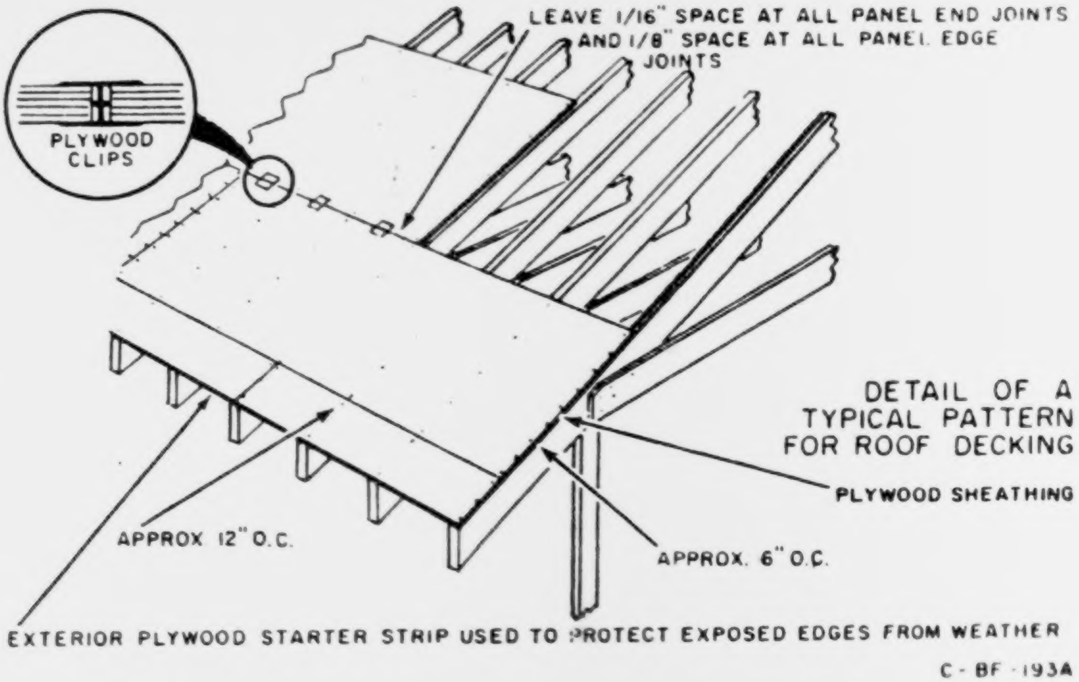
SHEATHING

Sheathing Material

Whether ordinary rafters or trusses are used for framing a roof, and regardless of the type of covering installed, some type of sheathing or decking must be placed over the frame first. In general, you can use the same type of 1-inch boards or plywood for roof decking as is used for subflooring and wall sheathing. The sheathing is usually installed across the rafters or other similar framing members. The decking should have good nail-holding characteristics and must be well nailed, since the roof covering is nailed to the decking rather than to the frame member. With certain types of roof-covering materials, a particular type of decking may be specified. When asphalt shingles or other composition materials are intended for the finished roof, the deck should be covered with plywood sheets or other types of material, forming a solid backing. For wood shingles, metal sheets or tile board sheathing may be spaced according to the course arrangement.

Installation Procedures

When the rafters or trusses have been installed, go back and check your work carefully to see that all the framework has been nailed properly and that all roof members are secure. The frame is then ready for the sheathing application.


LEAVE 1/16" SPACE AT ALL PANEL END JOINTS AND 1/8" SPACE AT ALL PANEL EDGE JOINTS
PLYWOOD CLIPS
DETAIL OF A TYPICAL PATTERN FOR ROOF DECKING
PLYWOOD SHEATHING
APPROX 12" O.C.
APPROX. 6" O.C.
EXTERIOR PLYWOOD STARTER STRIP USED TO PROTECT EXPOSED EDGES FROM WEATHER
C-BF-193A

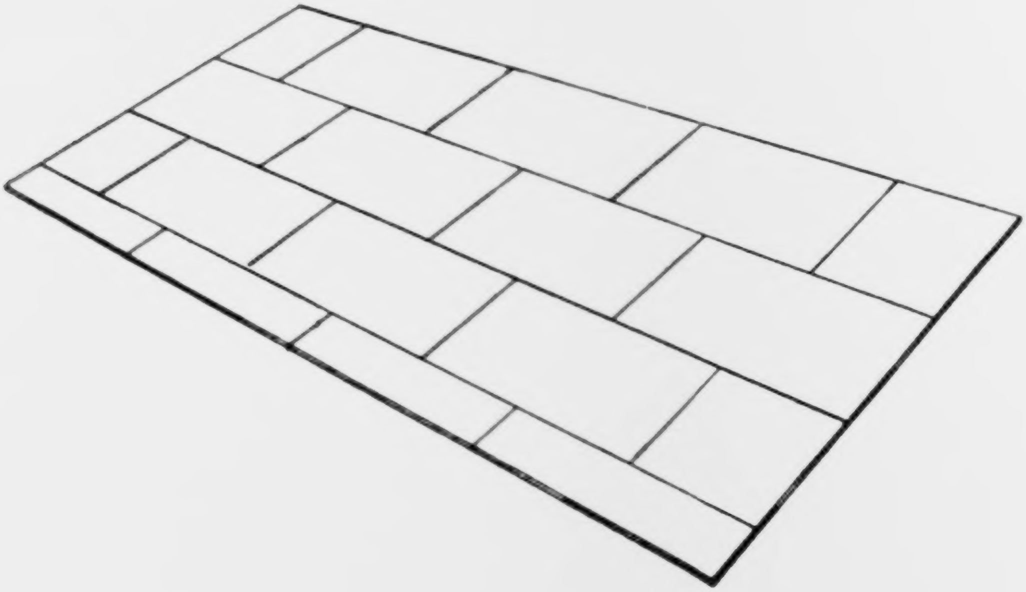


Figure 77. Typical Roof Deck Pattern Using Plywood Sheets

Before you install any roof sheathing, construct and erect the necessary scaffolding to provide a safe work platform. This scaffold construction, although time consuming, will pay dividends in the long run by increasing your work speed, once the actual roof sheathing begins; by the same token, a carefully designed scaffold can and, in most cases, will reduce personal injury to you and your fellow workers.

Sheathing is normally installed by your beginning at the eave of the roof and working your way to the ridge. Plywood sheets (decking grade) make an ideal material for roof sheathing. It can be installed quickly, resists shrinkage and swelling, and holds nails well. Plywood is generally laid with the long dimensions perpendicular to the rafters with the end joints formed and nailed at the center of the rafters. Like that of subflooring, the end joints are spaced and staggered according to the manufacturer's specification. You can see a typical plywood decking pattern in Figure 77. Pay special attention to the 1/16-inch space at all panel end joints and the 1/8-inch space at all panel edge joints. In geographic areas where moisture or humid conditions exist, these spaces should be doubled. Also notice that an exterior plywood starter strip is installed to protect the edges of the decking against exposure to the weather.

Once the roof sheathing has been installed, you should go back and check your nail pattern to insure that each sheet is secured properly, Figure 67, also illustrates a typical nail pattern for plywood sheathing. Clips are placed at the plywood joints between rafters for additional support. These clips are especially necessary when using a 3/8-inch to 1/2-inch plywood over rafters set 24 inches on center.

SUMMARY

Sheathing adds stability to a wall or roof, provides a surface to attach roofing or siding, and helps insulate a wall. Even if the sheathing cannot be seen, it should be installed correctly.

QUESTIONS

Answer question 11 on page 194 and questions 17, 18, and 19 on page 228 in Modern Carpentry. DO NOT write in textbook.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-III-6

ROOFING, VENTS AND LOUVERS

OBJECTIVES

a. Given incomplete statements, identify the procedures for installing, repairing, and replacing ventilators, and wall louvers by completing the statements. Four of five responses must be correct.

b. Given procedures, a sheathed roof, materials, tools, equipment, manufacturers' specifications and working as a member of a team install vents and ventilators with no more than five instructor assists.

c. Given procedures, a sheathed roof, materials, tools, equipment and working as a member of a team install roof flashing, eave strips, and roofing with no more than eight instructor assists.

INTRODUCTION

Roofing materials serve to protect the structure from the weather. There are various types and designs of roofing materials and varying methods of installation. Asphalt composition shingles are the most common type of shingles used in residental construction and are available in a variety of colors.

Vents and louvers are a necessary part of construction. They allow air circulation which assists in temperature and moisture control. The installation of a vent or louver will depend on the type and location of the vent or louver being installed.

ROOFS

Roof coverings are intended to shed water from a roof surface and prevent moisture from entering the building. There are many types of materials used. Although some of the materials may last less than 10 years, others may last longer than the exterior wall coverings and trim. Of the available types, the Air Force uses rolled roofing, asphalt shingles, built-up roofing, asbestos, slate, and tile for covering the roofs of their buildings and structures. In some cases, you may find wood shingles in use, but these are usually replaced when major repair is required with a more fireproof type.

Let's examine the procedures for installing each of the types of roof coverings in some detail. After you have a good understanding of the installation procedures, you will then study some of the better methods for maintaining roofs. We will begin our discussion with the types of underlayment and how it is applied.

Roof Underlayment

Asphalt-saturated roofing felts are used for roof underlayment; the underlayment should be material which has a low vapor resistance. You should never use such materials as plastic sheets, waterproof paper, or tar-coated felts which will permit moisture to accumulate between the roof sheathing and underlayment.

A roof underlayment performs many functions. Some are as follows:

a. It temporarily protects the roof sheathing and building from moisture until the finish roof can be installed.

b. It prevents direct contact between the resinous areas of the sheathing and the finished roof, which might otherwise cause a chemical reaction that would damage the roof material.

You should always store rolled roofing standing on end to prevent shifting (rolling) and puncturing the material. Ordinarily, rolled roofing would not be used on a roof where the slope is less then 2 1/2 inches per foot. It should be installed when the weather is clear, the temperature is at least 50°F, and the surfaces are completely dry. The roof deck must have solid sheathing or sound lumber. Knotholes or loose knots must be covered with sheet metal. Nails that extend above the roof must be driven flush with the surface or removed completely to prevent puncturing the roofing when it is put in place.

Install rolled roofing in courses, or rows, starting at the eaves and working up the roof. The roofing material must extend approximately 2 inches beyond the sheathing at the gable edges and at the eaves. This allows the roofing to be turned down neatly for water drainage. Space roofing nails approximately 6 inches apart and drive them through the roofing into the edge of the sheathing boards. The application of wooden strips is specified for extremely windy areas. The top edge of each strip must be nailed with roofing nails driven through tin or fiber discs.

Overlap the strip 4 inches on the preceding strip. The lap must be cemented with hot asphalt or cold applied sealing compound and secured with roofing nails. Space the nails 6 inches apart and 2 inches from the edge, as shown in figure 78.

In order for you to safeguard a roof against wind damage, the ends of the strips of roofing should be lapped a minimum of 6 inches in the direction of the prevailing wind, as shown in figure 79. The end lap should be sealed with lap cement and fastened with roofing nails space a minimum of 6 inches apart and approximately 2 inches from the exposed edge.

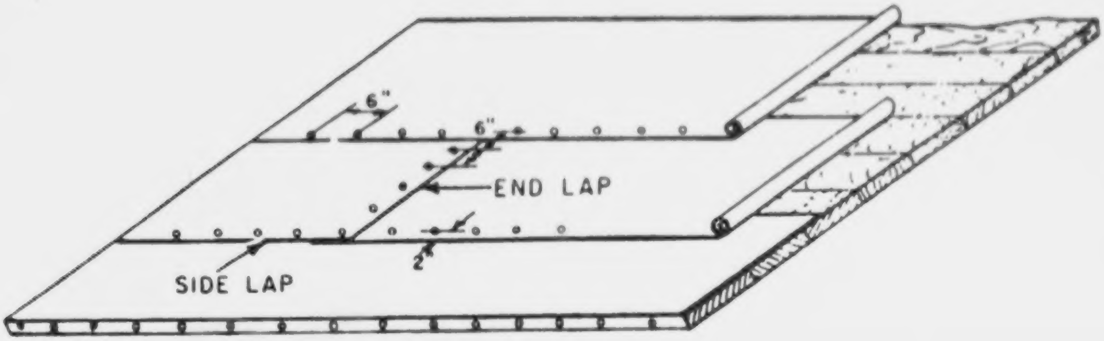


Figure 78. Spacing of Nails

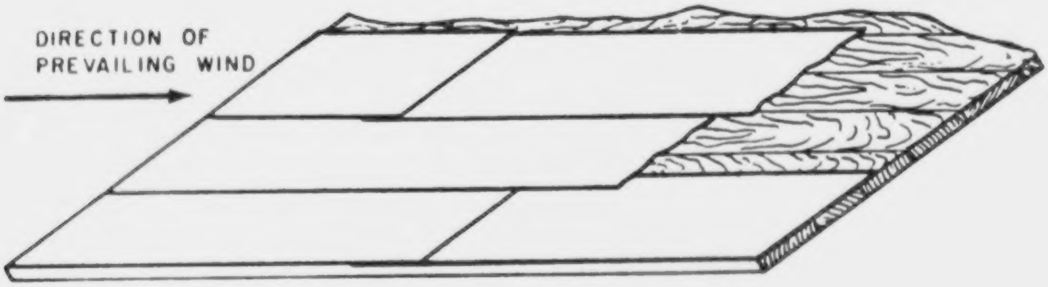


Figure 79. Overlapping Ends of Rolled Roofing

Cover the ridge and hips with a double layer of roofing material, and cement each layer and nail every 6 inches on both slopes. Although the pieces used for covering the ridge or hip must extend down each slope 4 inches, they are usually cut 12 inches wide.

You should always follow the manufacturer's instructions packed in each roll regarding the installation of rolled roofing when other specifications are not available.

Asphalt Shingles

Two types of asphalt strip shingles have been accepted as standard for roofing materials on buildings with sloping roofs. One of these types of shingles, shown at the top of figure is a standard weight, four-tab, 10- X 36-inch shingle intended for a 5-inch maximum exposure. Asphalt shingles are purchased by weight from 210-240 pounds per square. A square is the amount of roofing material needed to cover an area of 100 square feet.

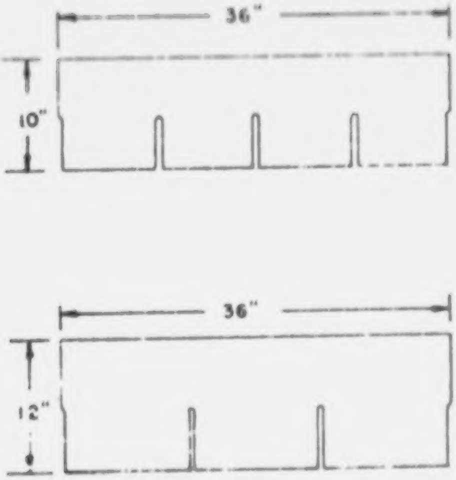


Figure 80. Types of Shingles

When you are installing asphalt shingles, a starting strip must be applied at the eaves. This starting strip must have granules of the same type and color as the shingles. When you use shingles having a different color on the bottom part as a starter, you must apply them with the cutouts toward the roof top and the first course doubled. The cutouts on the exposed course are centered on the tabs of the under course, with the cutouts in each alternate course directly in line. The joints between courses are staggered by starting the first course with a full shingle. The next three courses are started with shingles one-half tab shorter than each preceding course. You can see this shingle pattern in figure 81. The edge of the first shingle in the first course overhangs 3/8 to 3/4 inch past the side of the roof, and the tabs project approximately 3/4 inch below the edge of the sheathing, as shown in figure 81. The sides of the shingles at the edge are to extend 3/8 to 3/4 inch beyond the sheathing. To complete each course, full-width shingles are applied so that the ends barely touch each other. The portion of the shingle cut off to start a course can often be used at the opposite edge of the roof to complete the course.

Two galvanized roofing nails are placed approximately 3/4 inch above each cutout and in the same relative position at each end of the shingle, as shown in figure 82. You should start nailing at one end of the shingle and proceed regularly to the other. Be careful to keep the butts aligned with the top end of the cutouts in the course below. When you are laying thick-butt shingles, always nail through the thick portion. Practically all difficulties experienced with this type of shingle have resulted from nailing too high on the shingle. In windy areas the tabs are often cemented down.

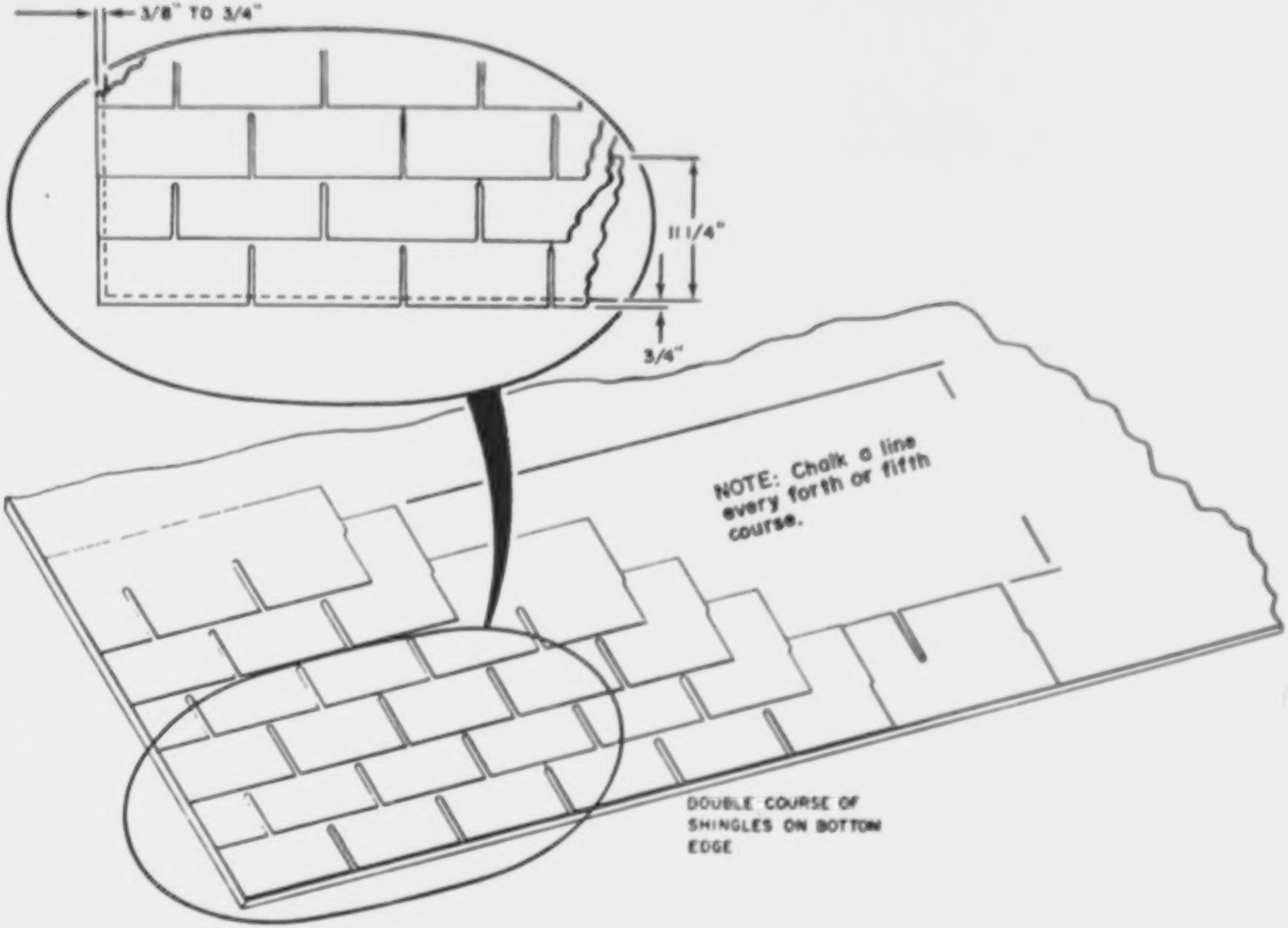

3/8" TO 3/4"
11 1/4"
3/4"
NOTE: Chalk a line every forth or fifth course.
DOUBLE COURSE OF SHINGLES ON BOTTOM EDGE

Figure 81. Placement of Shingles

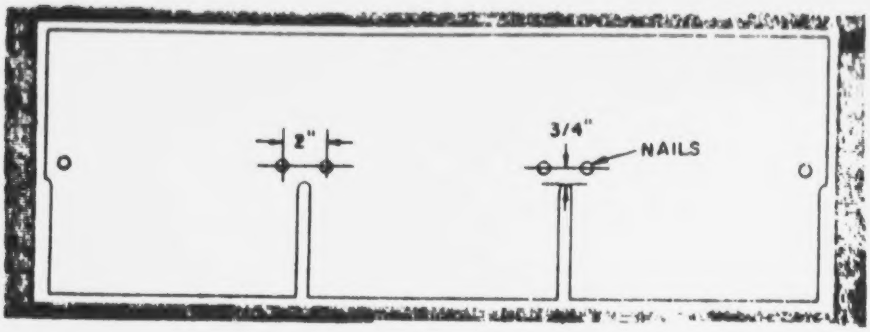


Figure 82. Nail Positions For Asphalt Shingles

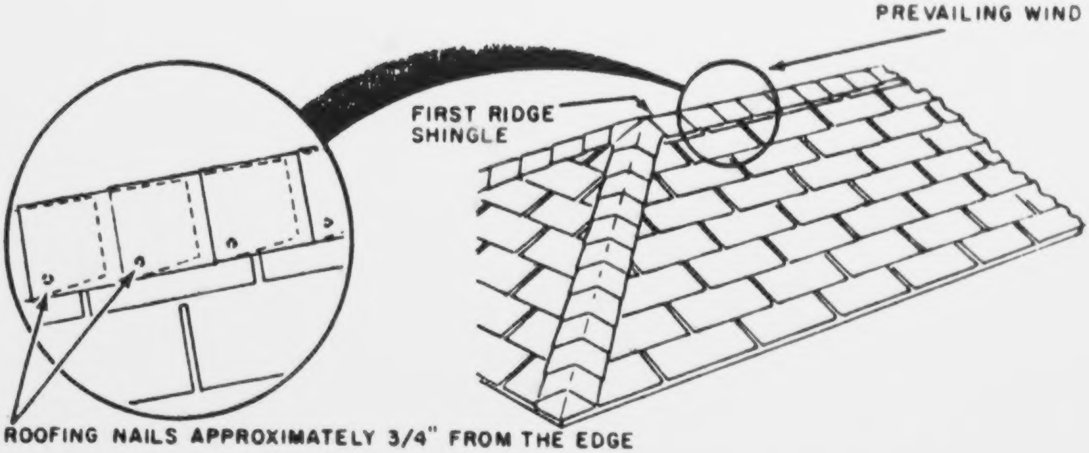

PREVAILING WIND
FIRST RIDGE SHINGLE
ROOFING NAILS APPROXIMATELY 3/4" FROM THE EDGE

Figure 83. Nail Positions For Ridge Cap Shingles

Ridges and hips are finished with individual shingle tabs provided by the manufacturer, with single shingles cut from strip shingles, or with strips of mineral-surfaced rolled roofing. Individual shingle tabs on the hip or ridge have the same exposures as the other shingles on the roof. They should extend equally on each side of the hip or ridge with one nail on each side about 3/4 inch from the edge as shown in figure 83. When you are placing shingles on the ridge, always work in the direction opposite the prevailing winds. That is place the ridge shingles in a manner where the prevailing wind will have a tendency to push the shingles down and not up.

Louvers

Louvers are vents designed to prevent the entrance of rain or snow. They are usually installed in the gable of buildings near the roof, as shown in figure 84. Venting of the area where louvers are installed prevents condensation of moisture and allows escape of hot air to aid in cooling buildings.

You may construct louvers according to many designs, or you may purchase them as prefabricated units. They may be made of either wood or metal, or a combination of both. Like windows, they are built within a frame. The frame holds horizontally mounted fins, vanes, or slats of metal or wood in a downward slanting position, from the inside to the outside. The slanting of the fins allows free circulation of air but prevents rain or snow from entering. The fins are usually nailed in position but may be adjustable for closing when desired. A screen is placed behind the fins to prevent entry of birds and insects.

Whether constructed in the shop or purchased, you will ordinarily install the louver as a unit. Installation procedures are very similar to that of window unit installation. That is, they are generally installed after the subsiding has been installed and before the finish siding is applied. Level and plumbing procedures are just as critical as in window installation. Nailing and weather proofing is also similar. If maintenance is necessary, it will usually be better to remove the complete unit so that repair of the frame, fins, or screen can be done more handily.

There is a wide variety of ventilating systems for roofs, cornices, and walls. One popular roof ventilating system is located in the cornice work as shown in detail in figure 85.

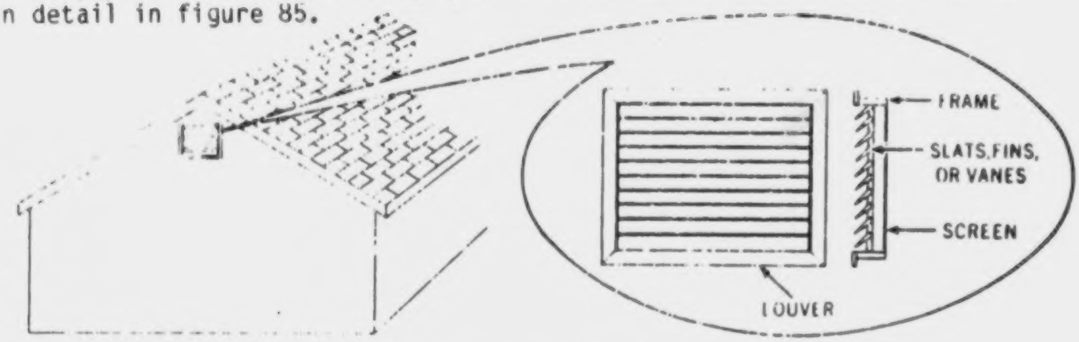


Figure 84. Lower Installation

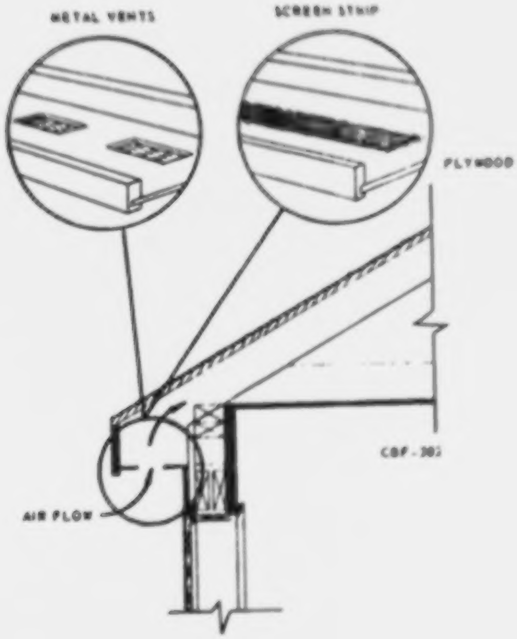


Figure 85. Cornice Vents

SUMMARY

The roof of a building protects the structure and its contents. Different types of materials, such as wooden shingles, composition roofing, built-up roofing, metal, and mineral fiber are used for covering. A knowledge of the properties of these materials and the correct procedures for installation are necessary for an efficient and watertight application. Factors to be considered in selecting roofing material are: The use of the building, appearance, durability, and cost. Most roofs can be repaired by careful application of new materials after damaged sections are removed.

QUESTIONS

Answer questions 1 thru 19, page 213. Record your answers on a separate sheet of paper. DO NOT write in the textbook.

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-III-7

TRIM AND SIDING

OBJECTIVES

a. Given true/false statements, identify the procedures for installing, repairing, and replacing conrice and siding.

b. Given procedures, a framed structure, materials, tools, equipment and working as a member of a team install cornice and siding with no more than seven instructor assists.

c. Given a structure, materials, tools, equipment and working as a member of a team install exterior wall trim with no more than five instructor assists.

INTRODUCTION

The installation of trim and siding is part of the exterior finish of a structure. There are many different types of siding used in residental construction and just as many ways to install siding. Many times the types of trim used and the trim's installation, will depend upon the type of siding used.

INFORMATION

Cornice and Exterior Finish Trim

In many cases, the cornice and other external trim are completed immediately after the roofing is finished. At other times, the windows and doors are installed before the cornice work goes up. The advantages here are that you can weatherproof the interior and provide some security for the building; that is, materials and other hardware can be secured inside the building at night and on weekends.

When we speak of finish trim, the widely held belief concerning "last minute touches" comes to mind. This is a myth that installing the trim usually cannot be done at the last minute when exterior wall finish is being completed. You will find much time is required to properly install the trim and that it is usually found in place before the finish siding is applied. There are times, however, when exterior trim is nailed over the finish siding.

Exterior Trim

Exterior trim is usually of 1 inch finish lumber. The width may vary with the architectural design, but usually it will be of 4 inch finish boards. Select good, straight boards which are free of knots for use as exterior trim.

Door and Window Casings

Usually these casing boards are installed as part of the door and window unit, as we have discussed previously. This trim can be of a special molded pattern or ordinary 1 X 4's nailed to the door or window frames on one edge and through the subsiding into the trimmers and headers on the other edge, as shown in figure 86. It helps to hold the door or window frames in place and cover the space between the frames and the trimmers and headers.

A drip cap is usually installed as a part of the casing above doors and windows to prevent the entry of moisture behind the casing. In other cases, a flashing is formed of copper or galvanized sheet metal and extended under the siding and over the upper casing. A typical drip cap for window and doors can be seen in figure 86.

Water Table

The lowest part of the outside finish of a wooden structure that meets the eye is the water table. It consists of two parts: (1) a base board, which is installed where the foundation wall stops and the framework begins; and (2) a drip cap, which is installed above the base board.

The purpose of the water table is to protect the foundation by deflecting rainwater away from the sills. Without a water table, water running down the walls would seep in, between the foundation and the sills, thus damaging the sills. Therefore, the water table is important and must be constructed with great care. Two different methods of constructing the water table are shown in figure 87. Since the outside wall covering begins at the water table, the water table must be constructed first.

Corner Boards

At the corners of the building, the wall covering, either shingles or siding, can be treated in one of several ways. The siding or shingles can be beveled and fitted together. The shingles can be lapped alternately, the siding can be butted and covered with metal caps or corner boards, like those shown in figure 88, can be installed.

You should tack a strip of building paper over the corner before placing the corner board in position for nailing, as illustrated in figure 89. To avoid rounding at the corner, you should fold the paper lengthwise and crease it to fit the corner of the building prior to tacking it in place.

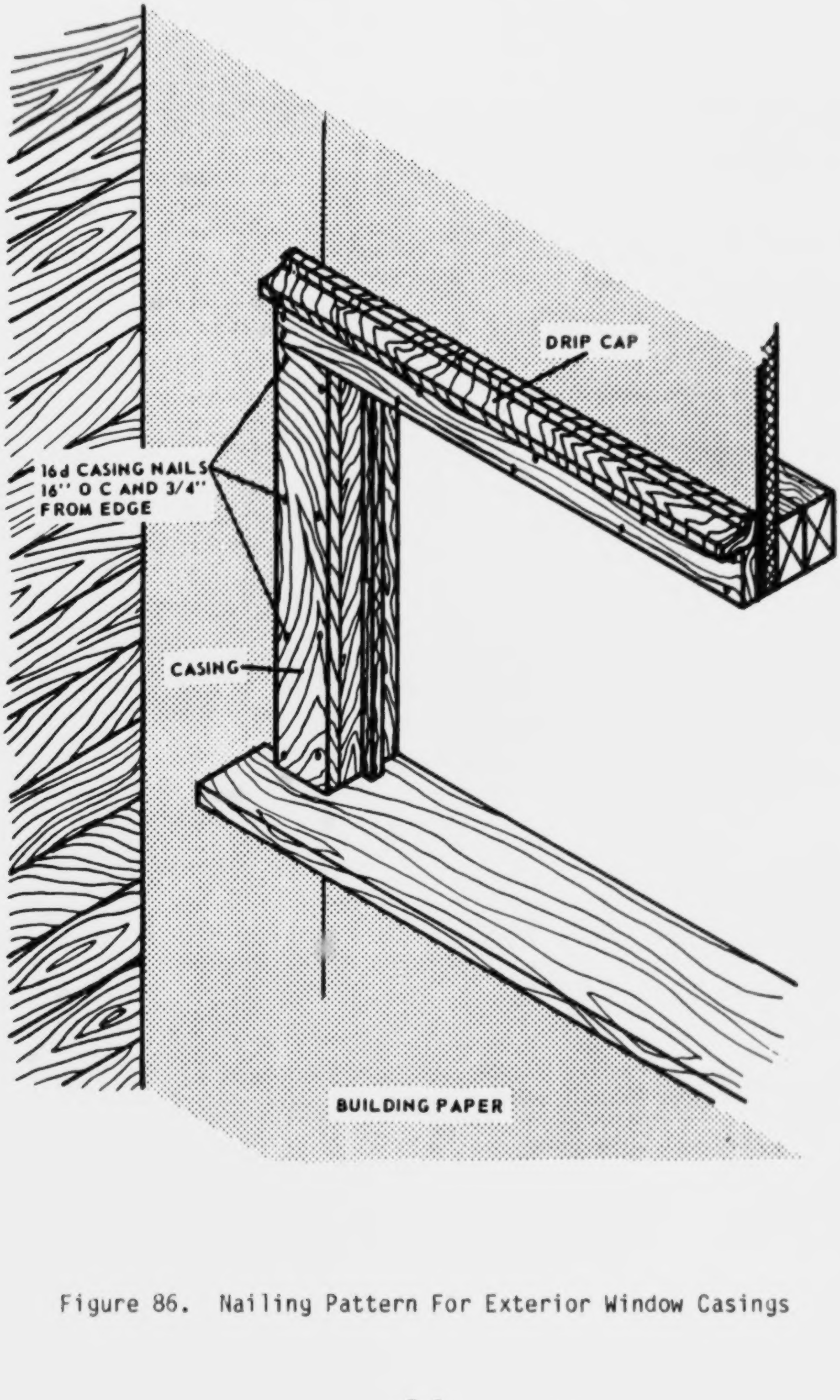
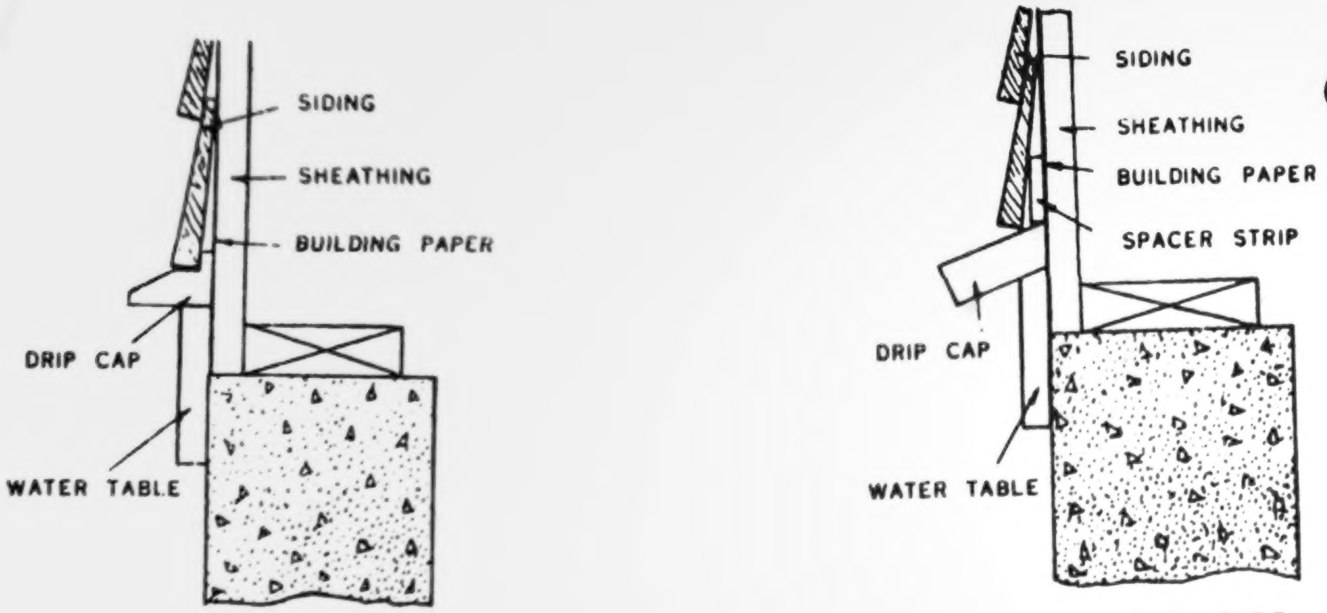

DRIP CAP
16d CASING NAILS 16'' O C AND 3/4'' FROM EDGE
CASING
BUILDING PAPER

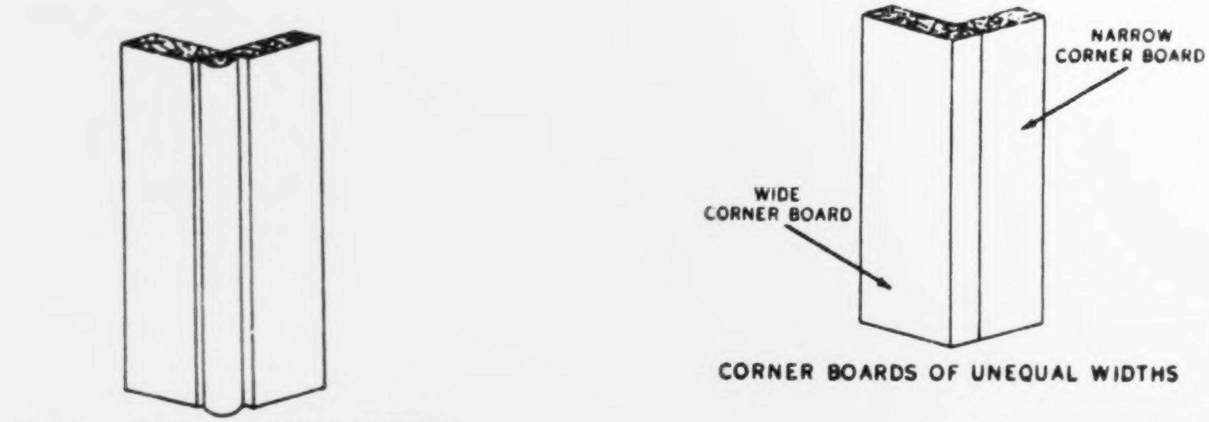
Figure 86. Nailing Pattern For Exterior Window Casings


SIDING
SHEATHING
BUILDING PAPER
DRIP CAP
WATER TABLE
SIDING
SHEATHING
BUILDING PAPER
SPACER STRIP
DRIP CAP
WATER TABLE

COMMON TYPE

BEVELED TYPE

Figure 87. Water Table Construction


NARROW
CORNER BOARD
WIDE
CORNER BOARD

CORNER BOARDS OF EQUAL WIDTHS
WITH QUARTER-ROUND

CORNER BOARDS OF UNEQUAL WIDTHS

Figure 88. Corner Boards

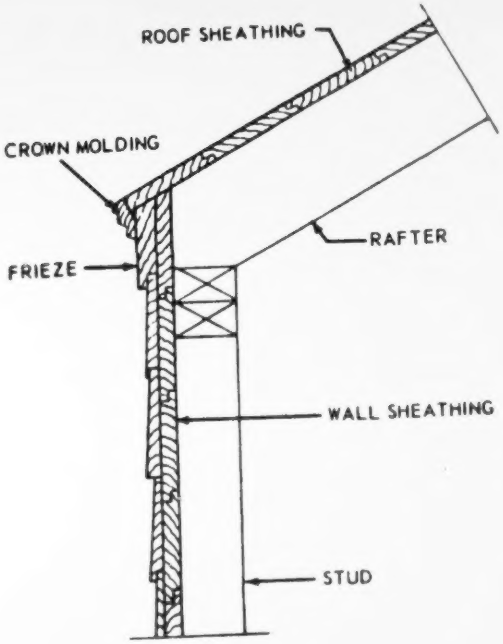

ROOF SHEATHING
CROWN MOLDING
RAFTER
FRIEZE
WALL SHEATHING
STUD

Figure 89. Corner Board Installation

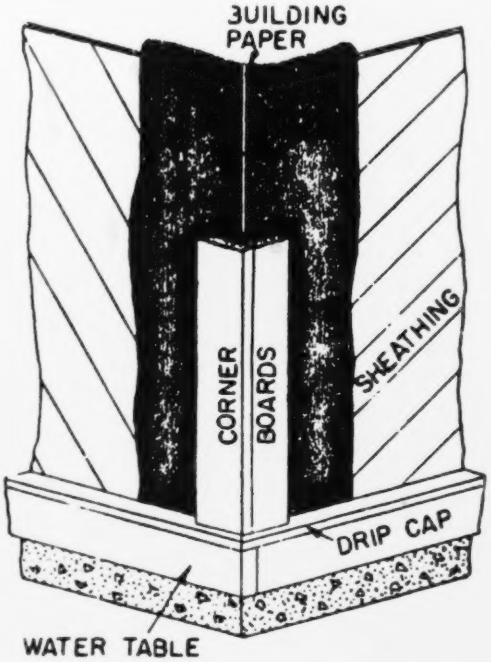

BUILDING PAPER
CORNER BOARDS
SHEATHING
DRIP CAP
WATER TABLE

Figure 90. Simple Cornice

Cornice Design

The cornice is sometimes known as the eave and its distinctive feature is that it is the finish connection between the roof and the wall. The cornice, like any other finish detail, is an important element in the overall attractiveness of a building. The type of cornice required for a specific building is indicated on the wall sections of the architect's drawing. When necessary, the drawing will also include a detailed view of the cornice design.

Simple Cornice

A roof with no rafter overhang usually has the simple cornice shown in figure 90. This cornice consists of a single strip, called a frieze, which is beveled on the upper edge to fit close under the overhang of the eaves and rabbeted on the lower edge to overlap the upper edge of the top course of siding. If trim is used, it usually consists of molding placed as shown in the same figure. Molding trim in this position is called crown molding. A roof with a rafter overhang may have an open or closed cornice.

Open Cornice

The simplest type of open cornice is illustrated in figure 91. As is true of the simple cornice, it consists only of a frieze, which in this case must be notched to fit around the rafters. If trim is used, it usually consists of molding cut to fit between the rafters as indicated. Molding trim in this position is called bed moulding.

Closed Cornice.

A closed cornice for a gable roof is generally constructed with a horizontal or sloping soffit.

A box cornice with a horizontal soffit is shown in figure 92. In this type, the rafter overhang is entirely boxed in by the roof covering, the fasica (a band between moldings), and a bottom strip, called a soffit or plancier. The soffit is nailed to the lower edges of a series of horizontal members called lookouts, which are cut to fit between the rafter ends and the face of the sheathing. The frieze, when used, is set just below the lookouts. The trim, if any, is placed and named as shown in the same figure.

A sloping soffit can be seen in figure 93. The soffit or plancier is nailed directly to the bottom side of the rafters of the overhang; for this reason the lookout, as described in the horizontal soffit, is not needed. Sometimes the back side of the facia is rabbeted to receive the soffit material as shown in the detail figure 92.

Gable End Cornice and Rake Section

The gable cornice trim on a gable-roof structure with a simple or open cornice is made by carrying the frieze and the crown molding up the rakes, as shown in figure 94. Molding trim along the rakes, however, is called rake molding. Figure 95 shows a complete gable-end-wall cornice and a rake section of a horizontal type soffit. Figure 96 shows another method for finishing the gable-end-cornice. As you can readily see, the crown molding and the facia are carried up the rakes, to then form the gable cornice trim. This form of cornice return is very attractive, and it works very well where the eave and gable-end overhang is not too great.

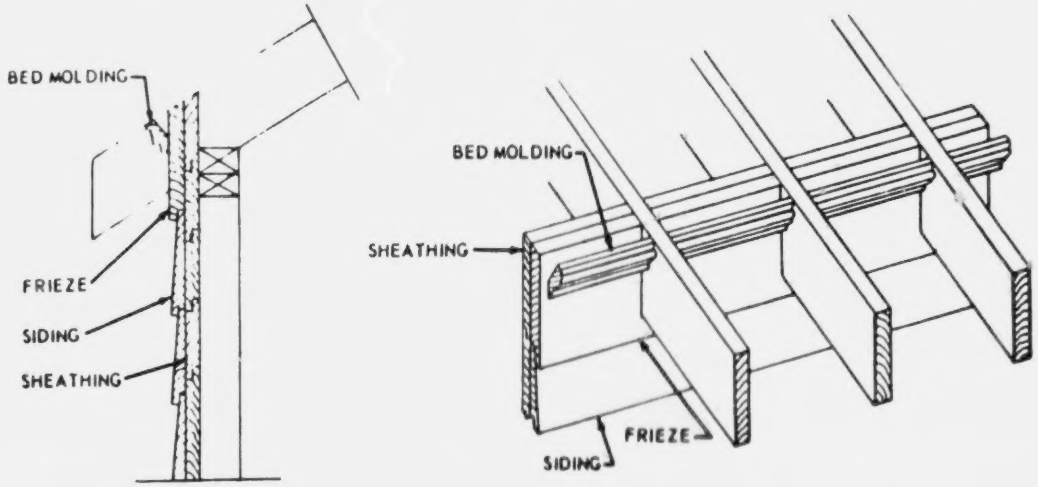


Figure 91. Simple Type of Open Cornice

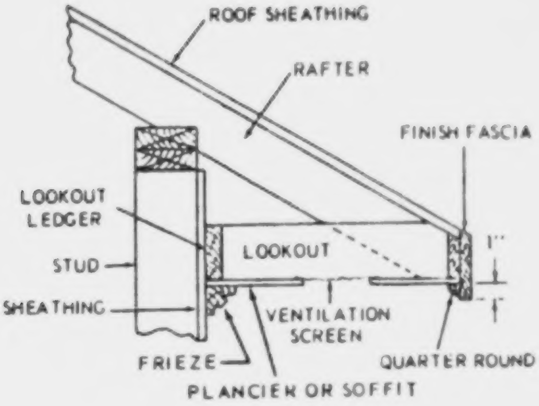

ROOF SHEATHING
RAFTER
FINISH FASCIA
LOOKOUT LEDGER
LOOKOUT
1"
STUD
SHEATHING
VENTILATION SCREEN
FRIEZE
QUARTER ROUND
PLANCIER OR SOFFIT

Figure 92. Box Cornice With a Horizontal Soffit

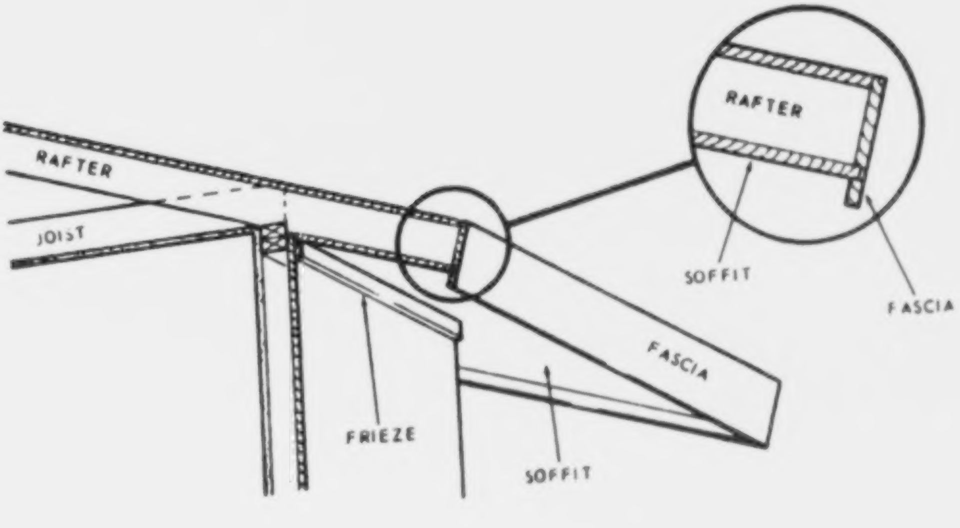

RAFTER
JOIST
RAFTER
SOFFIT
FASCIA
FASCIA
FRIEZE
SOFFIT

Figure 93. Sloping Soffit

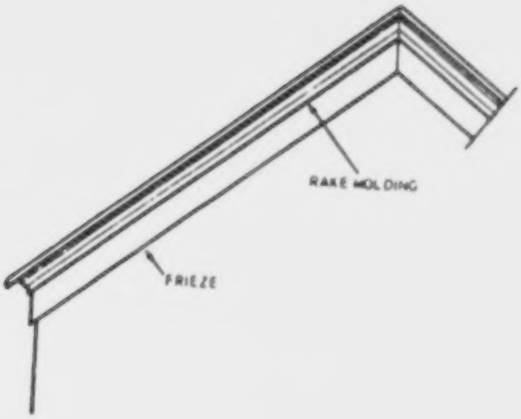

RAKE MOLDING
FRIEZE

Figure 94. Gable Cornice Trim on Gable Roof Structure With Simple Cornice

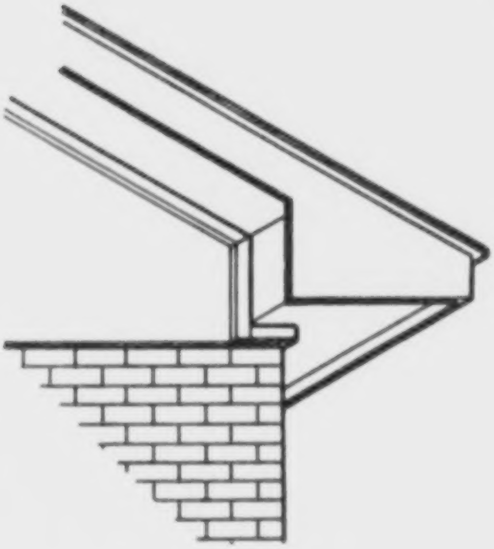


Figure 95. Gable End With a Finished Cornice and Rake

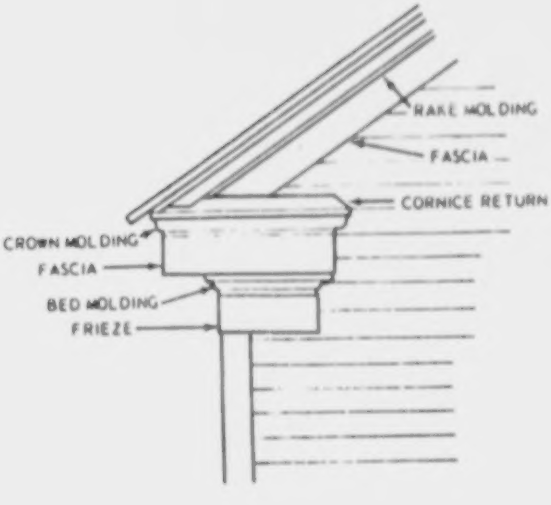

RAKE MOLDING
FASCIA
CORNICE RETURN
CROWN MOLDING
FASCIA
BED MOLDING
FRIEZE

Figure 96. Gable-End-Wall Cornice Return on a Gable-Roof Structure With a Closed Cornice

SIDING

Once the outside wall openings have been filled by installing doors, windows, and louvers, and the cornice, water table, and whatever other necessary trim have been applied, the exterior wall can be finished by covering it with siding. The siding is actually the "skin" of the building, which apparently is so important to its appearance and the satisfaction of those who see and use it. Although it is the thinnest part of the external wall, it certainly has important functions to perform besides those that can be seen. As our own skin holds and protects our bone framework and other vital functioning parts, so the exterior wall finish protects the rest of the wall from deterioration.

Preparation of Siding

Although we have already discussed the procedures for installing sheating paper to the building, you will find that it sometimes is necessary for you to go back to check the wall surface for any damages that may have occurred while you were installing the doors, windows, and cornice. Some of the areas you should check at this time, before applying the siding are:

a. Smoothness of the subsiding, watching for loose or warped boards or plywood that would prevent siding from lying flat.

b. The surface to insure that it provides an adequate nailing base for the finish siding, especially around wall openings.

c. Loose knots or large knotholes where lumber sheathing has been used.

d. Torn or missing sheathing paper.

e. Loose or sagging sheathing paper that may prevent siding from lying flat.

f. Moisture on the paper surface or between the sheathing and building paper.

You definitely should not apply finish siding on days when rain or snow might become trapped between the siding and the sheathing paper.

SIDING MATERIALS

Although there are many different types of materials used for exterior finishes, wood is ordinarily used, at least for the trim. In choosing wood for the exterior finish, you should consider several factors, such as decay resistance, paint holding quality, and lumber available for the exterior walls. Lumber that is warped or which has an excessive amount of knots should not be used. Materials used on the exterior walls of a building are building paper, plywood, wall covering, wooden siding, asbestos shingles, wood shingles, metal siding, vinyl siding, and masonry finishes of stone, brick, or stucco.

Plywood Wall Covering

Large panels of plywood are now available on the market for exterior use. The various layers in this plywood material are bonded together with waterproof resin glues. The standard sizes for residential construction are 48 inches wide, they are available in lengths of 8, 9, and 10 feet. Thickness commonly used are 5/16, 3/8, 7/16, 1/2 and 5/8 inch. Panels 3/8 inch and thicker, for example, are generally used for direct stud application, while 5/16-inch panels may be applied over a subsiding.

The thickness requirement for plywood wall panels will vary from building to building because of the stud spacing, type of subsiding used (if any), method of panel application, and other circumstances related to the wall load-bearing qualities. Plywood panels are normally applied in a vertical position to eliminate horizontal joints. You can, however, apply the panels horizontally and increase the walls load-carrying capabilities. Plywood panels do expand and contract; for this reason you should leave 1/16-inch spaces between all end and edge joints.

Wood Siding

Wood siding is the standard covering for wood frame buildings. It is milled in various patterns, as shown in figure 97. Since siding is exposed to the weather, the durability of the wood is an important factor to consider when selecting material for siding. Among the more durable woods for this purpose are cypress, cedar, and redwood. In addition to durability, these woods have good paint holding qualities, which is another important consideration. A type of wall siding adapted to formal architecture is the novelty siding. Decorative effects may be obtained by scoring the siding vertically with a grooving tool. Galvanized and aluminum nails are used to prevent dark rust streaks from forming on the wood.

Asbestos Shingles (cement-asbestos). One type of shingle frequently used in the modification of Air Force buildings is the asbestos shingle. It is a hard, brittle shingle made of cement and asbestos. These siding shingles are fireproof and have replaced or covered the wood siding on many Air Force buildings. They are 5/32 inch thick, 12 inches wide, and 24 inches long, and are available in many colors.

Install cement-asbestos shingles with rustproof accessories. The nails to use are aluminum and have a flat head. Install outside and inside corners and edge strips, shown in figure 98 over building paper before placing the shingles. Use felt strips under each vertical joint, as shown in figure 99. Caulk all edges-as around doors, windows, etc, to prevent water from getting behind the shingle. The color of the caulking should blend with the color of the shingles. When the nails are driven too tightly, they will cause the shingle to break. Whenever half shingles are required, cut them with a shingle cutter shown in figure 100, which is designed for that purpose. You may punch additional nail holes with the pin located on the handle. Use the nipper to chip out small portions to fit the shingle around obstructions.

Asbestos shingles are usually installed over 3/4 inch sheathing, because the random nailing does not occur on the studs. Some buildings have 3/4-inch sheathing, paper, wood siding, more paper, and the asbestos shingle installed on the surface. When you are remodeling a building, it is more economical for you to leave the old siding (if it is not completely rotten or warped) and place the shingles over it.

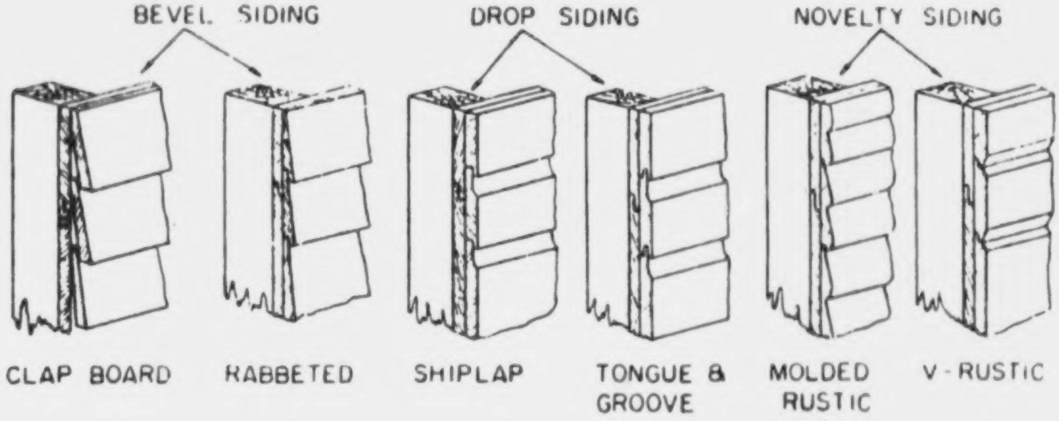

BEVEL SIDING
DROP SIDING
NOVELTY SIDING
CLAP BOARD
RABBETED
SHIPLAP
TONGUE & GROOVE
MOLDED RUSTIC
V-RUSTIC

Figure 97. Types of Siding

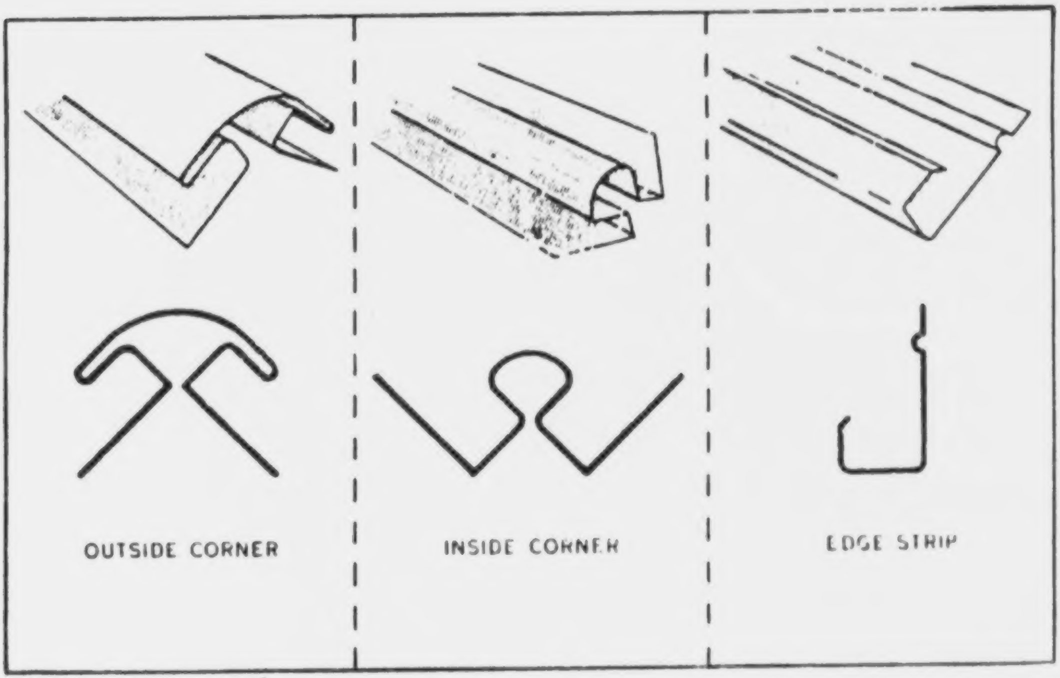

OUTSIDE CORNER
INSIDE CORNER
EDGE STRIP

Figure 98. Shingle Accessories

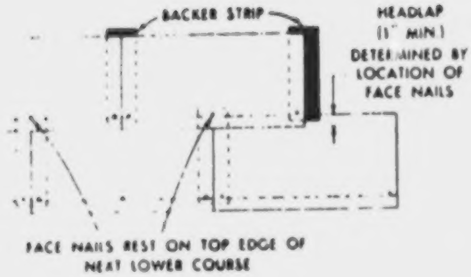

BACKER STRIP
HEADLAP (1" MIN) DETERMINED BY LOCATION OF FACE NAILS
FACE NAILS REST ON TOP EDGE OF NEXT LOWER COURSE

Figure 99. Location of Backer Strips and Nail Holes

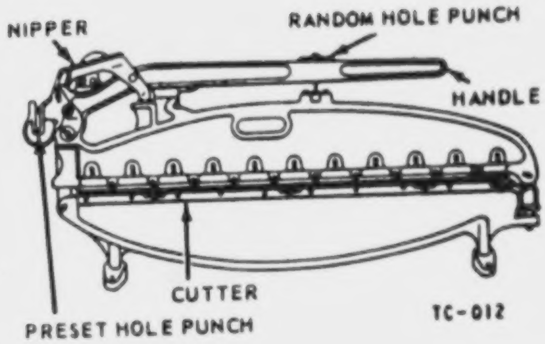


Figure 100. Shingle Cutter

A common method for installing asbestos shingles over fiberboard or other nonlumber sheathing is illustrated in figure 91. When the sheathing will not hold nails, use channel molding to hold the shingles. Nail the molding to the studs.

When it becomes necessary for you to replace a broken shingle of this type, carry out the repair in much the same manner as when you are repairing slate or asbestos roofing shingles. Be careful when removing broken shingles to prevent damage to the adjacent good shingles. When installing the new shingles, use the same procedures to nail them in place as were used for the original application. Make certain that all of the felt backer strips are in place to prevent water from collecting behind the shingles.

Wood Shingles

Install wood shingles with a doubled first course. The second layer is required to cover the joints in the first layer. Shingles used on exterior walls may be installed with more exposure to the weather (less overlap) than shingles on a roof, because the sun's heat does not reach them as directly and water runs off them quickly. They do not have the same tendency to cup (curl up on the edges) while drying, because they dry more slowly than do shingles on a roof. A quick change in moisture content will cause the shingles to rise at the edges or split.

Install dry shingles with a 1/4-inch space between them to allow for expansion when they absorb water. The amount of exposure to the weather is different for each shingle length: 7 1/2 inches exposed on 16-inch shingles, 8 1/2 inches exposed on 18-inch shingles, and 11 inches exposed on 24-inch shingles. In any case two layers of shingles must always be used to assure that water cannot enter through the joints.

For the best finish job, the nails used to fasten cabin-type siding or by the V-rustic type. Drop siding is available in a variety of shapes. The most common is shiplap or tongue-and-groove joints. Since it fits flush with the sheathing, it is fairly weathertight. It also acts as insulation against heat and cold. Bevel or lap siding is usually thinner than drop siding and adds greatly to the softness and refinement of shadow lines. It may be rabbeted or simply lapped as clapboard.

When installing wood siding, nail it at the studs. You can use either box or casement nails. If, however, you use casement nails, you should set them and fill the holes with putty. This is the best method to use where the paint to be employed will not hold on metal surfaces without special priming. Install drop siding and most types of novelty siding with 8d nails; whereas bevel siding may be put on with the 6d size. You should use nails which are either rust-resistant, such as galvanized nails should be hot-dipped, zinc-coated nails, or copper or aluminum. If a round nail is used, the type having a blunted 3-cornered tip is preferable, since when it is used, the shingle is less likely to split. Nail each shingle near each edge. Shingles over 10 inches in width should have at least three nails in them. Drive all nails flush and cover them by the next course of shingles.

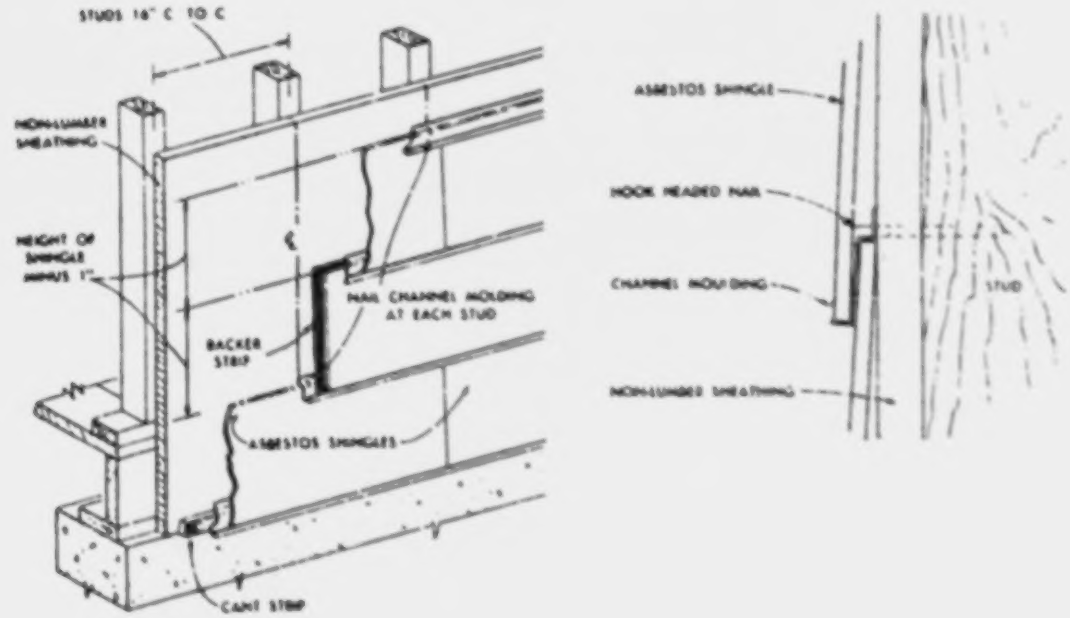

STUDS 16" C TO C
NON-LUMBER SHEATHING
HEIGHT OF SHINGLE MINUS 1"
NAIL CHANNEL MOLDING AT EACH STUD
BACKER STRIP
ASBESTOS SHINGLES
CANT STRIP
ASBESTOS SHINGLE
HOOK HEADED NAIL
CHANNEL MOLDING
NON-LUMBER SHEATHING
STUD

Figure 101. Use of Channel Molding

Metal and Vinyl (Plastic or Synthetic) Siding

Several types of metal and synthetic plastic siding materials are presently in use. Also, combination types exist, using metal as the base with vinyl or other plastic coatings. Research will undoubtedly lead to the development of more of these materials in the future.

The metal siding materials are usually flat, corrugated, or V-crimped sheets. These sheets may be of galvanized iron, steel, or aluminum. Always install metal siding with nails made of the same or a compatible metal to prevent corrosive action from occurring. Galvanized lead-headed nails may be used with galvanized iron or steel siding, and aluminum nails with plastic or neoprene seals are commonly used with aluminum siding. These materials are used for covering sheds and other storage buildings, where durability is more important than the architectural appearance.

Flat metal sheets may be purchased in almost any size; whereas corrugated and V-crimped sheets are usually 26 inches wide and in lengths of 6 to 12 feet. You may install these sheets horizontally, but they are more often placed vertically. Nail them on the top of the corrugations or crimps rather than in the valleys. The amount of nailing required will vary with the particular installation. Ordinarily a row of nails across the sheet at 2-foot intervals, with a nail on every fourth corrugation, will be adequate. The side lapping of V-crimped sheets is predetermined by its shape; whereas corrugations are nailed every six inches along the edge. The end laps, where necessary, should be approximately 4 to 6 inches.

Vinyl or other plastic materials are usually used for decorative purposes. Because of the ease of molding these materials during manufacture, they may be made in a variety of shapes. A wide selection of colors is also available. Special nails are available, and you should select them to match the material. The amount of nailing required will vary with the shape of the material and the characteristics of the installation. However, the general methods used for fastening metal siding may often be used.

Precoated or combination metal and plastic siding is usually formed to resemble some type of wooden siding. Usually some type of channel molding is used to install this kind of siding, so that nailing through the precoating material is avoided. In cases where new or special types of siding materials are being installed, consult the manufacturer for recommendations concerning methods and fastening devices.

SUMMARY

The outside appearance of a structure is affected by the type and design of exterior trim and siding. But no matter how costly or intricate the materials are, their final worth may only be estimated by how well they were installed. This involves a knowledge of the materials and the installation proccedures involved, as well as a high degree of physical skill.

QUESTIONS

Answer questions 1-16 on pages 323, Chapter 12 of Modern Carpentry. DO NOT write in the textbook.

WORKBOOK
J3ABR55230 000-III-1 thru 7

TECHNICAL TRAINING

Carpentry Specialist

BUILDING CONSTRUCTION

May 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use
DO NOT USE ON THE JOB

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This workbook contains the measurement devices designed to ensure that you have mastered the required tasks and knowledges as reflected in the current training standard.

The workbook will be controlled by the instructor at all times and will be used to evaluate your attainment of objectives. Upon completion of each workbook exercise, your response or actions will be graded and annotated as satisfactory (S) or unsatisfactory (U) on the criterion checklist. You must attain a satisfactory grade on all objectives in each instructional unit for the entire block, prior to being administered the end-of-block written test.

This workbook will remain the property of the course and will be destroyed upon satisfactory completion and annotation of objectives in the criterion checklist.

UNDER NO CIRCUMSTANCES will you be allowed to remove this workbook from the classroom and/or training areqa as applicable unless under the direct supervision of your instructor.

Supersedes WB J3ABR55230 000, December 1985
(Copies of superseded publications may not be used.)

FOUNDATION AND FORM CONSTRUCTION

COURSE: J3ABR55230-000

PC: III-1a

PROJECT OR TASK: Form Construction

OBJECTIVE: Given incomplete statements, identify the location, construction, and erection procedures for forms for slabs, walls, footings, ramps, and steps by completing the statements.

INSTRUCTIONS:

1. This is Progress Check III-1a.
2. You are to work individually and without instructor assistance while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress checks to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(Knowledge)

Complete the following statements involving form construction.

1. When forming a footing the form should be constructed at least _______ as wide as the foundation wall.

2. In slab form construction the entire form is checked for square by using the ________ method.

3. Slab form corners may be checked for square by using the _______ method.

4. The ideal riser height in stair form construction is _______ inches.

5. The ideal tread width in stair form construction is ______ inches.

6. The total ideal riser height and ideal tread width is ________ inches.

7. When constructing forms for ramps a slope of _______ degrees must be provided.

8. A wall form member which is installed horizontally and provides horizontal alignment of the wall form is the _______ member.

9. A _______ allows the wall frame and the footing to be secured to one another.

10. When constructing a slab form, a general rule while excavating is the (more/less) subgrade you disturb the better.

COURSE: J3ABR55230-000

PC: III-1b

PROJECT OR TASK: Slab Form Construction

OBJECTIVE: Given procedures, tools, materials, equipment and working as a member of a team construct a form for a concrete slab with no more than three instructor assists. The completed form must be within ± 1/8" of square and level.

INSTRUCTIONS:

1. This is Progress Check III-1b.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document does not fulfill this obligation.
4. Three instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION I for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(Performance)

Using procedures provided and working as a team member, demonstrate proficiency by constructing forms for a concrete slab

1. Find the highest elevation point in the area designated for the construction of the form.
2. Drive a stake at the highest elevation point.
3. Use the right triangle method to establish a corner for the form.
4. Construct the form.
5. Square and level the form.
6. Check the form for square using the diagonal method.
7. Adjust form for squareness if the diagonal measurements do not coincide.
8. Finished forms must be within ± 1/8" of square and level.

LIGHT FRAME CONSTRUCTION

COURSE: J3ABR55230-000

PC: III-2a

PROJECT OR TASK: Frabicate and Install Sills, Joists, and Sub-floors

OBJECTIVE: Given a foundation wall, tools, materials, equipment and working as a member of a team fabricate and install sills, joists, and subfloors with no more than eight instructor assists. Installed units must be square, plumb, and level.

INSTRUCTIONS:

1. This is Progress Check III-2a.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Eight instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION I for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(Performance)

Working as a team member, demonstrate proficiency by constructing and installing sills, joists and subfloors.

1. Fabricate materials for sills.

2. Install sills.

3. Fabricate materials for joists.

4. Install joists.

5. Fabricate material for bridging.

6. Install bridging.

7. Fabricate material for subfloor

8. Install subflooring materials (plywood or solid lumber).

9. Ensure installed units are square, plumb and level.

COURSE: J3ABR55230-000

PC: III-2b

PROJECT OR TASK: Fabricating and Installing Walls and Partitions

OBJECTIVE: Given a subfloor, tools, materials, equipment and working as a member of a team fabricate and install walls and partitions and frame openings for windows, doors, louvers, and utilities with no more than eight instructor assists. Installed units and openings must be square and plumb.

INSTRUCTIONS:

1. This is Progress Check III-2b.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Eight instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION II for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION II

(Performance)

Working as a member of a team, demonstrate proficiency by installing walls and portitions.

1. Layout area for walls, doors, windows, louvers and utitiles.

2. Cut materials to specifications.

3. Fabricate walls with door, window, louvers and utitiles openings.

4. Frame partition wall.

5. Install wall and partition units.

6. Ensure that installed walls, partitions and openings for windows, doors, louvers and utilities are square and plumb.

7. Clean work area.

SCAFFOLD CONSTRUCTION

COURSE: J3ABR55230-000

PC: III-3a

PROJECT OR TASK: Scaffold

OBJECTIVE: Given procedures, equipment, materials and working as a member of a team construct, erect and remove scaffolding with no more than four instructor assists.

INSTRUCTIONS:

1. This is Progress Check III-3a.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with objective. Observing or reading a maintenance document does not fulfill this obligation.
4. Four instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION I for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(Performance)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Horse scaffolding
   - a. Procure 2 saw horses (check them for safety).
   - b. Procure two 2" x 10"s (test board for proper support).
   - c. Place 2" x 10"s on saw horses to erect simple scaffold.
   - d. Reverse procedures for disassembly.
2. Erection of sectional steel scaffolds.
   - a. Set footing plates.
   - b. Insert leveling jacks.
   - c. Install end panels.
   - d. Install diagonal braces.
   - e. Check quick locks.
   - f. Plumb and level scaffolding.
   - g. Install decking.
   - h. Erect scaffold to desired height.
   - i. Install toeboards and guardrails.
3. Scaffold Removal
   - a. Remove toeboards and guardrails.
   - b. Remove decking.
   - c. Reverse of erection.

COURSE: J3ABR55230-000

PC: III-4a

PROJECT OR TASK: Fabricate and Install Rafters and Trusses

OBJECTIVE: Given four installed wall frames, materials, tools, equipment and working as a member of a team fabricate and install rafters and trusses on the wall frames with no more than eight instructor assists.

INSTRUCTIONS:

1. This is Progress Check III-4a.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Eight instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION I for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(Performance)

Working as a member of a team demonstrate proficiency by completing the following exercise:

1. Rafters:
    a. Cut ceiling joist to length.
    b. Install ceiling joist on 16" O.C.
    c. Lay out and cut rafters.
    d. Lay out and cut ridgeboard.
    e. Install ridgeboard with rafters (24" O.C.).
    f. Lay out and cut collarties.
    g. Install collarties on alternating pairs of rafters.
    h. Lay out and cut gable end studs.
    i. Install gable end studs over common studs.

2. Trusses:
    a. Using pattern pieces cut materials needed to build trusses.
    b. Assemble trusses.
    c. Ensure all joints are tight.
    d. Apply connectors (plywood gussets) to both sides of truss.
    e. Install the trusses on 24" centers.
    f. Apply safety practices while constructing and installing trusses.

SHEATHING

COURSE: J3ABR55230-000

PC: III-5a

PROJECT OR TASK: Sheathing and Building Wallpaper

OBJECTIVE: Given true/false statements, identify the procedures for in-installing wall sheathing, roof sheathing, and exterior building wall paper.

INSTRUCTIONS:

1. This is Progress Check III-5a.
2. You must work individually with no notes, reference materials, or instructor assistance to complete this progress check. You must provide correct responses to all items on this progress check.
3. Upon completion of this progress check, return the progress check to your instructor.
4. Your instructor will grade this progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
5. After grading your progress check, your instructor will return the progress check to you for review. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I

(Knowledge)

Identify the following statements as TRUE or FALSE by putting T in the blank for true statements or F in the blank for false statements.

____ 1. Corner bracing is usually not required when plywood sheathing is installed vertically in the corners of the walls.

____ 2. Plywood clips should be used with 1/2 inch plywood roof sheathing.

____ 3. Sheathing helps insulate a wall.

____ 4. When open sheathing is used on a wall, the building paper can be applied either between shingles and sheathing or between studs and sheathing.

____ 5. Shingles or shakes can be applied over old siding or other wall coverings that are sound and will hold nailing strips. When doing this, you first apply building paper over the old wall.

COURSE: J3ABR55230-000

PC: III-5b

PROJECT OR TASK: Installing Bulding Wallpaper, Wall and Roof Sheathing

OBJECTIVE: Given a roof frame, a wall frame, materials, tools, equipment and working as a member of a team install wall sheathing, roof sheathing, and exterior wall building paper with no more than five instructor assists.

INSTRUCTIONS:

1. This is Progress Check III-5b.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document does not fulfill this obligation.
4. Five instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION I for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION II

(Performance)

Working as a member of a team demonstrate proficiency by completing the following performance exercise.

1. Install closed sheathing on one side of the roof and open sheathing to the other side of the roof.

2. Install plywood sheathing on one wall with the plywood installed vertically on the corners of the wall.

3. Install common lumber to one wall with the boards installed diagonally.

4. Install building paper to one of the sheathed walls.

ROOFING VENTS AND LOUVERS

COURSE: J3ABR55230-000

PC: III-6a

PROJECT OR TASK: Roof Vents, Ventilators and Louvers

OBJECTIVE: Given incomplete statements, identify the procedures for installing, repairing, and replacing ventilators, and wall louvers by completing the statements. Four of five responses must be correct.

INSTRUCTIONS:

1. This is Progress Check III-6a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to 4 of 5 items on this progress check.
5. After completing this progress check, return it to your instructor.
6. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

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MISSION I

Complete the following statements.

1. Gable roofs usually have louvers in the __________ ends.

2. Ventilators located on the roof may leak if not _________ installed.

3. Insufficient insulation or _________ directly under low pitched roofs may cause a special problem.

4. Venting of the area where louvers are installed prevents ______ of moisture and allows hot air to escape.

5. A screen is placed behind the fins of the louver to prevent birds and insects from __________.

COURSE: J3ABR55230-000

PC: III-6b

PROJECT OR TASK: Roof Vents and Louvers

OBJECTIVE: Given procedures, a sheathed roof, materials, tools, equipment, manufacturer's specifications and working as a member of a team install vents and ventilators with no more than five instructor assists.

INSTRUCTIONS:

1. This is Progress Check III-6b.

2. Your instructor will assign you to a team for the completion of this progress check.

3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document does not fulfill this obligation.

4. Five instructor assits per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials required for completing this progress check.

6. You must fulfill all obligations outlined in the instructions to MISSION II for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION II

(Performance)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following performance exercise:

1. Determine type, size and number of vents and ventilators.

2. Determine area to be ventilated.

3. Minimum opening should be 1/4 sq inch for every square foot of ceiling area.

4. Install required vents and ventilators according to manufacturers specifications.

COURSE: J3ABR55230-000

PC: III-6c

PROJECT OR TASK: Installing Roof Flashing, Eve Strips, and Roofing

OBJECTIVE: Given procedures, a sheathed roof, materials, tools, equipment and working as a member of a team install roof flashing, eve strips, and roofing with no more than eight instructor assists.

INSTRUCTIONS:

1. This is Progress Check III-6c.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document does not fulfill this obligation.
4. Eight instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION III for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION III

Working as a member of a team demonstrate proficiency by completing the following exercise.

Drip Edge (Flashing)

1. Measure the area for drip edge (along eve and rake).
2. Install drip edge at eave and rake.

Eave Strip

1. Measure area for eave strip.
2. Install eave strip. Eave strip must be wide enough to extend from roof's edge to about 12 inches inside wall line.

Building Paper

1. Chalk line for fist course
2. Start at lower edge of roof or wall
3. Unrolladn fasten first course

Asphalt shingles

1. Chalk line for first course
2. Allow 1/4" to 3/8" overhang at eaves and gables
3. Install starter strip (cut-outs facing up) or rolled roofing
4. Double first course
5. Fastening (roofing nails)
   a. Use 4 nails minimun
   b. Use 6 nails in high wind areas for more holding power
6. Chalk lines every 3 courses (insures horizontal and vertical alignment) (due to irregularity in shingle size)
7. Use half lap pattern
   a. Start first course with full shingle
   b. Second course - Full shingle minus 1/2 tab
   c. Third course - Full shingle minus full tab
   d. Fourth course - 1/2 shingle
   e. Repeat procedure

TRIM AND SIDING

COURSE: J3ABR55230-000

PC: III-7a

PROJECT OR TASK: Cornice and Siding

OBJECTIVE: Given true/false statements, identify the procedures for installing, repairing, and replacing cornice and siding.

INSTRUCTIONS:

1. This is Progress Check III-7a.
2. You must work individually to complete this progress check. You must provide correct responses to all items to satisfactorily pass this progress check.
3. You will use no notes or reference materials and will not receive instructor assistance while completing this progress check.
4. You will be graded on an ATC Form 98 (Student Progress Checklist) using "S" for satisfactory and "U" for unsatisfactory.
5. Return the completed progress check to your instructor. Progress Checks are a CONTROLLED ITEM.

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MISSION I

(Knowledge)

Identify the following statements as TRUE or FALSE by putting T in the blank for true statements or F in the blank for false statements.

____ 1. The strips placed over the joints of vertical wood siding are called battens.

____ 2. The finished visible section of a cornice which closes the underside of the rafters is called the fascia.

____ 3. The horizontal cornice member nailed to the building to which the lookouts are secured is called the frieze.

____ 4. Fascia should be installed before roof sheathing.

____ 5. Nail holes must be placed in cement asbestos shingles/siding with a cement asbestos shingle cutter.

COURSE: J3ABR55230-000

PC: III-7b

PROJECT OR TASK: Installing Cornice and Siding

OBJECTIVE: Given procedures, a framed structure, materials, tools, equipment and working as a member of a team install cornice and siding with no more than seven instructor assists.

INSTRUCTIONS:

1. This is Progress Check III-7b.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document does not fulfill this obligation.
4. Seven instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION II ' for this performance evaluation.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION II

(Performance)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following performance exercise.

1. Cornice construction

   a. Obtain a point at each end of the wall level to the lower most portion of the tail cut of the rafter.

   b. Chalk lines between these points.

   c. Install ledger with the lower edge flush to the chalk line.

   d. Cut to length.

   e. Install lookouts at each rafter by toenailing to ledger and face nailing to rafter.

   f. Install fascia (if not already installed).

   g. Install soffit and frieze molding.

2. Siding installation (horizontal)

   a. Snap chalk line for first course. This will be accomplished by measuring from ground level up the wall the height of the siding.

   b. Use the half-step method. First course start with full piece of siding; second course use 1/2 piece; third course start with full piece, etc.

   c. Snap chalk line every 3 courses to ensure proper alignment.

   d. Nail siding with non-corrosive nails. Full pieces have nail holes. The nails go at the bottom of each piece of siding.

   e. Use cement-asbestos shingle cutter to cut siding and place nail holes in siding.

COURSE: J3ABR55230-000

PC: III-7c

PROJECT OR TASK: Install Exterior Wall Trim

OBJECTIVE: Given a structure, materials, tools, equipment and working as a member of a team install exterior wall trim with no more than five instructor assists.

INSTRUCTIONS:

1. This is Progress Check III-7c.
2. Your instructor will assign you to a team for the completion of this progress check.
3. As a member of the team, you must work as an ACTIVE TEAM MEMBER, you will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document does not fulfill this obligation.
4. Five instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials required for completing this progress check.
6. You must fulfill all obligations outlined in the instructions to MISSION III for this progress check.
7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. Return the completed progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION III

(Performance)

Working as a member of a team demonstrate proficiency by completing the following exercise.

1. Install corner boards using 1" x 4" material.

2. Install spacer strips using scrap 1" x 2" material. If scrap material is not available, use new material.

3. Install window and/or door casings.

STUDY GUIDE
J3ABR55230 000-IV-1 thru 4

TECHNICAL TRAINING

Carpentry Specialist

FINISH CONSTRUCTION

June 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use
DO NOT USE ON THE JOB

Purpose of Study Guide

This study guide (SG) is designed to guide you through your study assignment in the most logical sequence for easy understanding and to provide you with practical exercises or work in conjunction with each study assignment. Complete each exercise or work assignment in the sequence given and it will aid you in understanding and retaining the key points in each assignment.

Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Questions will be addressed at that time. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

Study Guide J3ABR55230 000-IV

Unit	Title	Page
1	Stairs	1-1
2	Windows, Screens, and Glass	2-1
3	Doors and Door Hardware	3-1
4	Insulation, Gypsum Board and Ceilings	4-1

Supersedes SG J3ABR55230 000-IV, December 1985
(Superseded copies may not be used.)

STAIRS

OBJECTIVE

Given tools, equipment, materials, and working as a member of a team construct and install steps with no more than five instructor assists. The steps must be plumb and level.

INTRODUCTION:

Stairs are a vital part of every structure. You must know all aspects of stair construction from porches to full length stairways and landings to be proficient in your career field.

INFORMATION

Stairs are a series of steps leading from one level of a building to another. Stairs are also referred to as "stairway" or "staircase". In addition to interior staircases for multi-story buildings, exterior stairways are also common throughout the Air Force. Porch steps and fire escapes, for example, are among the many uses of exterior stairways.

There are many designs that you can use for stair construction, depending on the layout of the building, the architectual effects desired and the needs of the area. But the basic construction requirements are the same for all of the designs, it is these that you must be familiar with.

In any major construction you will be able to get the stairway construction information from blueprints. If you are just to add a set of rear service steps your supervisor may just tell you to "get it done", it is now that you need an understanding of stair design.

Stairs are installed at an angle of 30° to 50° with 30° to 35° preferred. This is done by use of the proper ratio of tread width - the part stepped on, to riser height - the vertical distance between treads. There are several methods used to determine this, but we will limit ourselves to one.

Treadwidth + Riser Height = 18"

Allowances may be made for the use of standard material when determining actual treadwidth. If regular 11-1/4 inch stair tread material (a standard 2 X 12) is used, the tread width should be 10 inches, with 1-1/4 inches allowed for the nosing which extends over the riser, as shown in Figure 1. A cover or quarter-round molding is used to cover the joint made by the nosing and riser. When the riser height is 7-1/2 inches, a 2 X 10 piece which measures 9-1/4 inches may be used for the tread boards. When this is done, the nosing is flush with the riser, as shown in Figure 1 and the risers are left open.

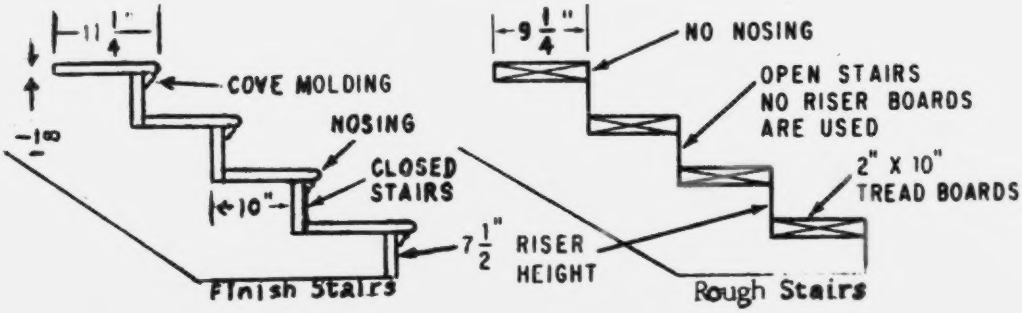


Figure 1. Tread Width Allowance

Headroom is another consideration. Headroom is the vertical clearance from the edge of the tread to the nearest enclosed surface, Figure 2. If the stairs are to be installed in a two story structure an opening in the second level joists must be framed during construction, this requires additional support as well as allowing the proper amount of headroom. If the proper amount of headroom is not available because of an improper upper level floor framing, the angle of the stairs may be increased to form a steeper stairway by increasing the riser height and decreasing the tread width. But the riser should never be increased to more than 8", with the ideal height being 7". The headroom used in Air Force construction is 7' - 6". The FHA requires a minimum of 6' - 8" for main stairs and 6' - 4" for service stairs.

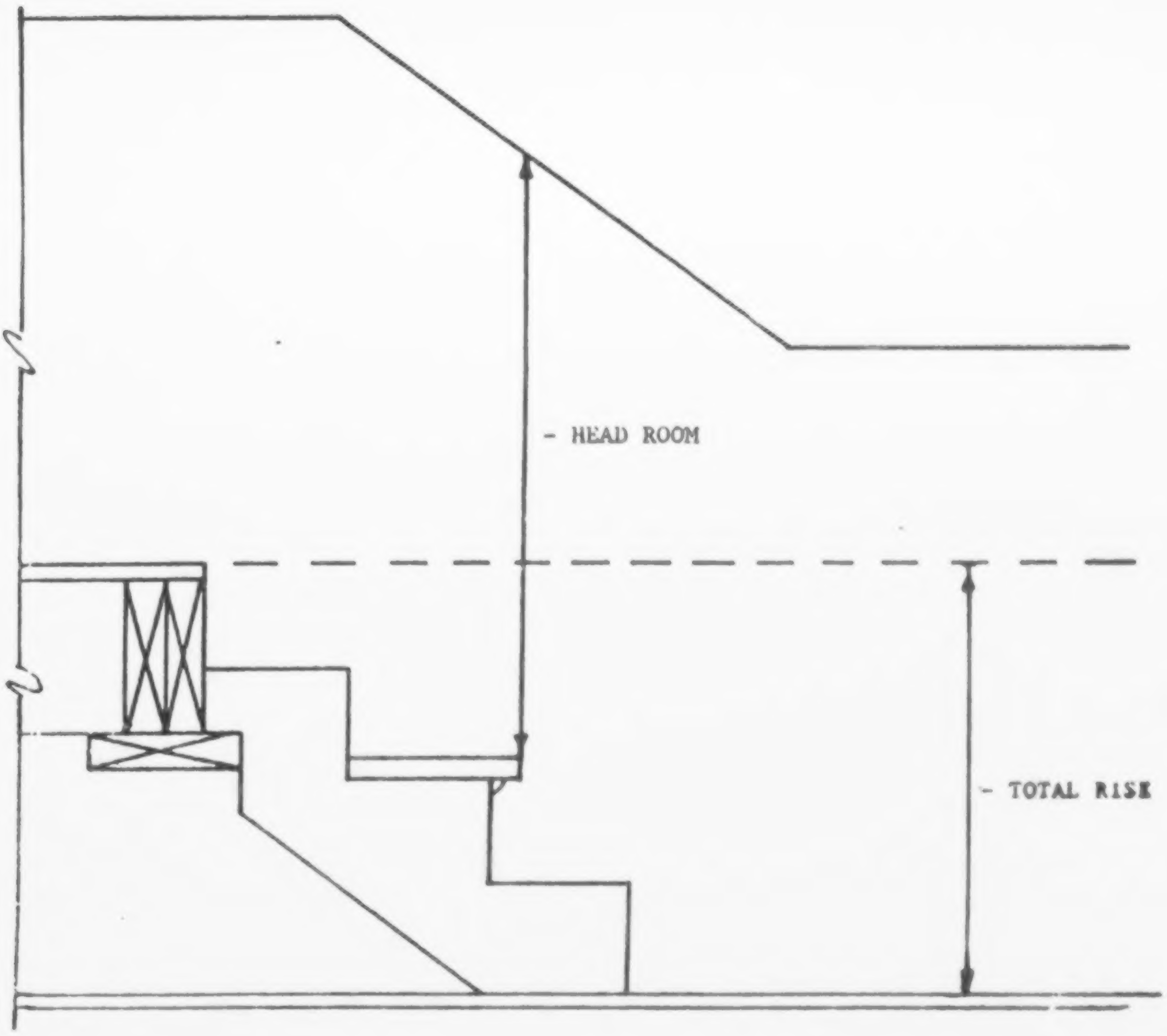

- HEAD ROOM
- TOTAL RISE

Figure 2. Headroom and Total Rise

The treads and risers are supported by stringers (carriage) on each side of the stairway. On wide stairs, a third stringer is centered between the two outside stringers. Stringers should be constructed out of 2 X 12s but may be constructed out of 2 X 10s.

The layout for treads and risers is accomplished on the stringer, using a framing square and is based on the total rise - total vertical distance from one floor level to another, Figure 2. The following steps may be used to determine the amount of treads and risers, to layout, and their size, based on the total rise. A total rise of 30" will be used in the example below.

1. Divide 7 (the ideal riser height) into the total rise

$$\begin{array}{r|l} & \overline{\;4\ 2/7\;} \\ 7 & 30 \\ & \underline{28} \\ & 2 \end{array}$$

2. Round your answer to the nearest whole number

   4 2/7 = 4

   This is the total number of risers

3. Divide the whole number of risers back into the total rise

$$\begin{array}{r|l} & \overline{\;7\ 2/4 \text{ or } 7\ 1/2"\;} \\ 4 & 30 \\ & \underline{28} \\ & 2 \end{array}$$

4. Subtract the exact riser height from 18

$$\begin{array}{r} 18" \\ \underline{-\ 7\ 1/2"} \\ 10\ 1/2" \end{array}$$

   This is the tread width

We have determined that a total rise of 30" has 4 risers with a 7 1/2" riser height and a 10 1/2" treadwidth. But we will only layout 3 risers and treads on the stringer, with the fourth riser being the header of the floor frame, Figure 3.

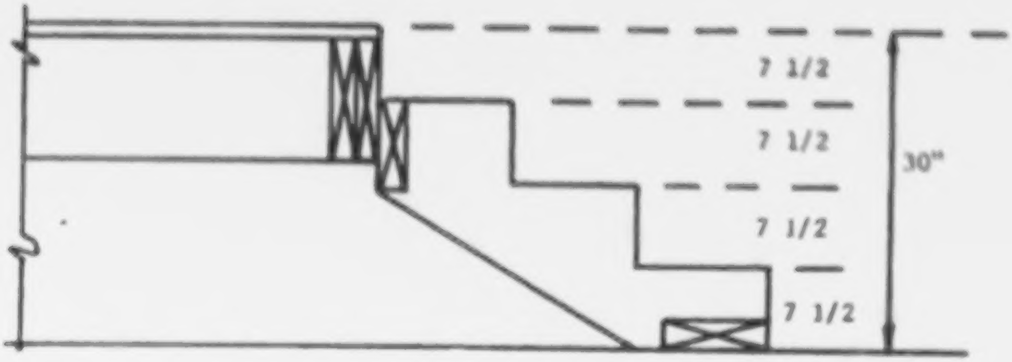


Figure 3. Total Riser and Stringer Risers

The layout of the stringer may be accomplished with the framing square after the riser height and treadwidth are determined. To do this a fence may be set up on the framing square at the inch marking points determined to be the riser height and treadwidth, Figure 4. The frame is set on the square, but left loose while the square is positioned on the stringer at the appropriate markings, the fence is then flushed up tight to the stock and secured to the square. The fence is an aid in repeating identical measurements and is recommended for use in stringer and rafter layout work. You can make the measurements freehand if you don't have the fence.

The stock is positioned with the crown towards you and the square is positioned, as in Figure 5a. We will lay the stringer out from left to right, and from top to bottom. (NOTE: Stairs may be laid out from the bottom up). If you remember, the earlier example had a total of 4 risers but only 3 risers (and treads) were laid out on the stringer. We will use this example in our layout explanation.

With the square in position draw a line along the outside edge of the tongue and body and mark a 1 between the layout marks. The mark at the tongue must be contined across the stock. This is accomplished by repositioning the square on the opposite edge of the stock and marking the continued line or simply by using the original layout mark as a guide and the framing square as a straight edge, (Figure 5b). Move the square back to the original position and slide the square until the tongue meets the previous layout mark from the body, (Figure 5c). Continue this procedure for each additional cutout to be made. After the last cutout is laid out (in our case we have laid out 3) slide the square one more time and place a layout mark only at the tongue, (Figure 5d). It is at this point that a new problem occurs. All risers need to be equal, if there is a variance in any of the riser heights an injury could occur. If there is a difference between the thickness of the treads and the finish floor the last riser at the top and bottom will be different from the rest of the finished risers, (Figure 6). To correct this the stringer must be dropped a distance equal to the difference between the tread material and the finished floor. Example: If the tread is 1 1/8" thick and the finished floor is 3/4", the stringer must be dropped 3/8".

The last mark on the stringer was the final riser, once the drop has been determined, measure back from the bottom of the riser a distance equal to the drop, and place a mark. The square is then inverted, the unit of rise and the unit of run lined up on the edge of the stock and slid until the body meets the mark on the riser. A line is drawn at this point, see Figure 7. The treads and risers are cut out using a handsaw and the stringer is ready for installation.

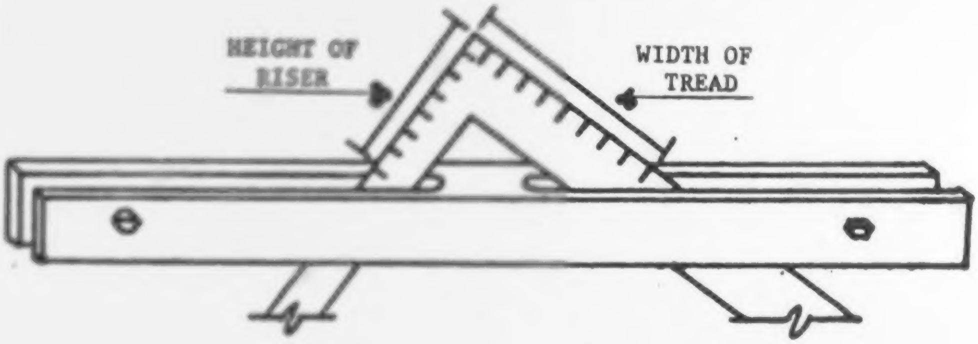
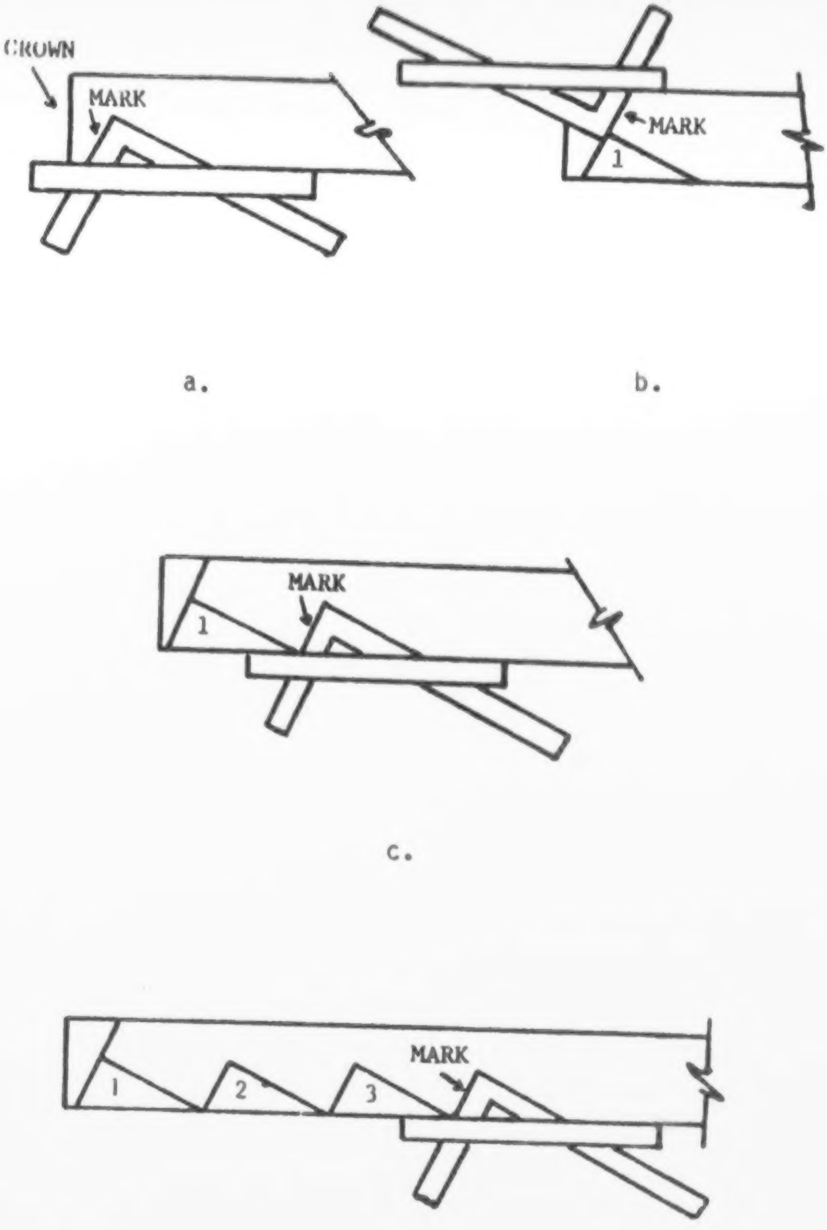


Figure 4. Fence for Framing Square Guide


CROWN
MARK
MARK
1
MARK
1
MARK
1
2
3

a.

b.

c.

d.

Figure 5. Stair Layout

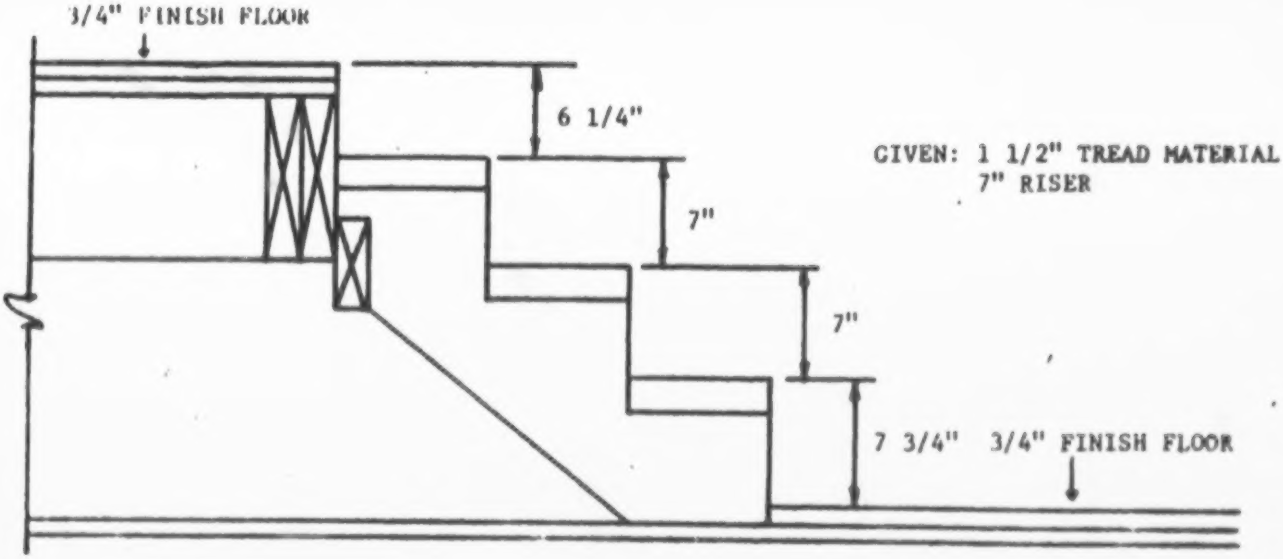

3/4" FINISH FLOOR
6 1/4"
7"
7"
7 3/4"
3/4" FINISH FLOOR
GIVEN: 1 1/2" TREAD MATERIAL
7" RISER

Figure 6. Installed Stringer That Was Not Dropped

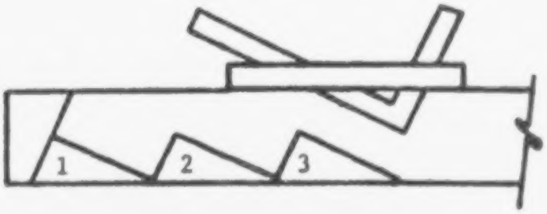


Figure 7. Dropping the Stringer

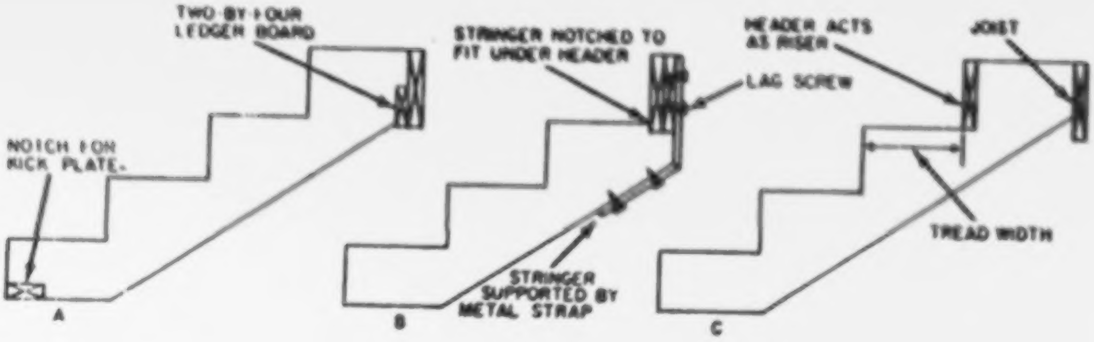

TWO BY FOUR LEDGER BOARD
NOTCH FOR KICK PLATE.
A
STRINGER NOTCHED TO FIT UNDER HEADER
LAG SCREW
STRINGER SUPPORTED BY METAL STRAP
B
HEADER ACTS AS RISER
JOIST
TREAD WIDTH
C

Figure 8. Anchoring Stringers

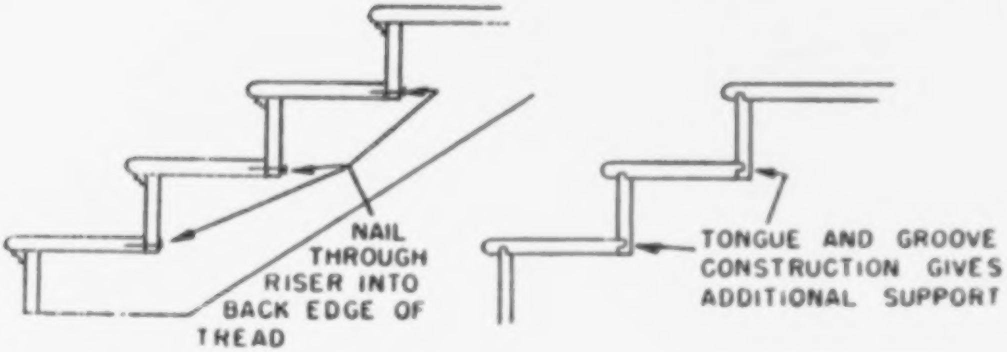

NAIL THROUGH RISER INTO BACK EDGE OF TREAD
TONGUE AND GROOVE CONSTRUCTION GIVES ADDITIONAL SUPPORT

Figure 9. Installing Treads and Risers

Figure 8A shows the stringer notched to fit over a ledger board. The ledger board is secured to the stringer and is then fastened to the porch header or joint to form a solid support for the steps. The bottom of the stringer is notched out for a 2 X 4 kick plate (sometimes known as the mud sill). The plate serves as a tie, holding the bottom edge of the stringers in position, and as a means of fastening the steps to the concrete footings (if required). The bottom of the stringer should not be placed on the ground, and long stringers, such as fire escapes, should be secured by using anchor bolts through the kick plate into the footings. Figure 8B and C shows two other methods of stringer attachment for steps and stairs.

Check all of your measurements after you finished marking for the ledger board and kick plate. This first stringer can be cut and used as a pattern to mark the other stringer. After the second stringer is cut, you can cut and place the riser and tread boards and molding.

The riser boards are nailed in place first; then the tread boards are nailed in front of them. Nailing through the back of the riser into the tread will help support the back edge of the tread, as shown in Figure 9. Also shown in Figure 9 is the use of tongue-and-groove risers and treads. This type of construction gives additional support to the stairs. When riser boards are not used, the tread is buttered against the riser cutout. This is the usual method for porch steps such as those in our sample project.

SUMMARY

Stair construction is an intricate part of construction. A properly constructed stairway is not only pleasing to the eye, but must also be safe to walk on.

QUESTIONS

Unit 16, page 418 answer questions 1-11. Do not write in the textbook.

3750 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-IV-2

WINDOWS, SCREENS, AND GLASS

OBJECTIVES

a. Given incomplete statements, identify the procedures for installing or replacing window units, screens, and glass by completing the statements.

b. Given procedures, window frame, sash, tools, materials and working as a member of a team install the window frame and sash in an exterior wall with no more than five instructor assists. The window must operate without binding and be within ± 1/8" of plumb.

c. Given procedures, screen, materials, tools, equipment and working as a member of a team install screen materials in a frame with no more than five instructor assists. The installed screen must be tight and free of wrinkles.

d. Given window glass, tools, materials, equipment and working as a member of a team replace the glass in a window frame with no more than five instructor assists. The installed window glass must fit tightly and be water tight.

e. Given procedures, safety equipment, glass, tools and working as a member of a team exercise safety precautions while handling glass.

f. Given procedures, a window, tools, equipment and working as a member of a team realign the window frame with no more than three instructor assists. The window must operate freely without binding.

INTRODUCTION

Windows, screens and glass are componets of your AFSC, you must have a working knowledge of these componets. As a Carpentry Specialist you must be able to recognize quality in materials, fittings and finish. Also, you must appreciate the importance of correct installation.

INFORMATION

Glazing.

The glazing of wood or metal sashes and doors consists of two main functions: (1) sash conditioning, and (2) replacement of glass. Both of these functions are explained in this booklet. The maintenance of windows is usually very simple and often involved only the replacement of the putty. When maintaining and reglazing windows, use the same type and quality of materials that were used originally.

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Wood sash may be glazed at the factory or on the job. In some instances, it reduces breakage and labor cost to do the glazing at the job site. however, when a number of wood sashes are to be used, it is generally cheaper and faster to have the glazing done at the factory.

Steel sash is generally furnished open and the glazing is performed on the job.

Types of Glass

Single-strength glass is approximately 1/16-inch thick and is used for small areas never to exceed 12 square feet. Double-strength glass is approximately 1/8-inch thick and is used where high wind resistance is necessary. Window glass comes in three grades (AA) or superior grade, (A) or very good and (B) for general or utility grade.

Heavy sheet glass comes in various thicknesses from 3/16 inch to 1/4 inch and in sheet sizes up to 76 inches wide and 120 inches long. Sheet glass is sometimes used for windows but is usually reserved for greenhouses. It is wavy and may cause a slight distortion of images viewed through it.

Plate glass is manufactured in a continuous ribbon and cut into large sheets. Plate glass is ground and polished for high quality. It comes in thicknesses from 1/8 inch to 1-1/4 inches and is usually used for large windows such as store fronts.

Tempered glass is glass that has been heated to just below its melting point and then suddenly cooled. Tempered glass cannot be cut or drilled and must be ordered to exact size. It will withstand heavy impacts and great pressure, but if tapped near the edge, will disintegrate into small pieces.

Heat strengthened glass is made by reheating polished plate or patterned glass and then rapidly cooling it.

Patterned glass is a rolled flat glass with an impressioned design on one or both sides.

Wire glass is a regular rolled flat glass with either a hexagonal twisted or a diamond-shaped welded continuous wire mesh as near as possible in the center of the sheet.

Heat absorbing glass is usually a heavy sheet glass, 1/8-inch or 1/4-inch thick. It is either a bluish or greenish color, and it has the ability to absorb the infrared rays from the sun. More than 34 percent of the heat is excluded.

Insulating glass units are comprised of two or more sheets of glass separated by either 3/16-inch, 1/4-inch, or 1/2-inch airspace. These units are factory sealed and the captive air is dried to eliminate condensation between the glass panes. They are made of either window glass or polished plate glass. Special units may be obtained of varying combinations or heat absorbing, laminated patterned or tempered glass.

Glare reducing glass is available in double strength, in panes up to 60 inches X 80 inches, and either 3/16-inch or 7/32-inch thick. One-fourth inch glass is available in panes up to 72 inches X 120 inches in size. It is light gray in color and it gives clear vision. Glare reducing glass is also slightly heat absorbent. One-fourth inch glass will exclude about 21 percent of the sun's heat rays.

Laminated glass is comprised of two or more sheets of glass with one or more layers of transparent vinyl plastic sandwiched between them. An adhesive applied with heat and pressure forms the layers into one unit. The elasticity of the plastic cushions any blow against the glass, preventing sharp pieces from flying. There is also laminated glare reducing glass where the pigment in the vinyl plastic provides the glare control quality.

Sash Preparation

Attach the sash to the structure so that is will withstand the design load. Adjust, plumb, and square the sash to within 1/8-inch of the nominal dimensions on the shop drawings. Seal all sash corners and fabrication intersections to make the sash watertight. Primer paint all sealing surfaces of wood or steel sash. Use appropriate solvents to remove grease, lacquers, and other organic protecting finished from the surfaces of aluminum sash.

Glass Cutting

When possible, glass should be stocked in sizes that can be used without cutting. Glass of special sizes may be cut in the shop. For glass sizes, measure all four sides of the sash and deduct 1/16 to 1/8 inch in the light size for irregularities in the sash. Minimum equipment required for glass cutting consists of a table, a common wood or metal T-square, and a glass cutter. The table should be about 4-feet square with front and left-hand edges square. Mark off the surface of the table vertically and horizontally in inches. A thin coating of turpentine or kerosene applied where the glass is to be cut is helpful in lubricating the action of the cutter wheel. A sharp cutter must be carefully drawn only ONCE along the line of the desired cut. Additional strokes of the cutter may result in breakage.

Check the dimensions of the sash openings to be sure that there are adequate clearances on all four sides of the glass. No attempt should be made to change the size of heat-strengthened, tempered, or double-glazed units since any such effort will result in permanent damage. All heat absorbing glass must be clean cut. Nipping to remove flares or to reduce oversized dimensions of heat-absorbing glass is not permitted.

PREPARATION BEFORE GLAZING

Old Wood Sash

Clean all putty runs of broken glass fragments and glazier's points. Remove loose paint and putty by scraping. Wipe the surface clean with cloth saturated in mineral spirits or turpentine. Sand putty run and coat with linseed oil or thinned exterior paint, and allow to dry. This is done to prevent the oils from being absorbed from the fresh putty of glazing compound.

New Wood Sash

Remove dust, prime the putty runs, and allow them to dry. All new wood sash shall be pressure-treated for decay protection in accordance with Federal Specifications TT-W-571.

Old Metal Sash

Remove loose paint or putty by scraping. Use steel wool or sandpaper to remove rust. Clean the surfaces thoroughly with a cloth saturated in mineral spirits or turpentine. Prime bare metal and allow it to dry thoroughly.

New Metal Sash

Wipe the sash thoroughly with a cloth saturated in mineral spirits or turpentine to remove dust, dirt, oil, or grease. Remove rust with steel wool or sandpaper. If the sash is not directly factory-primed, prime it with rust-inhibitive paint and allow it to dry thoroughly.

SETTING GLASS

Do not glaze or reglaze exterior sash when the temperature is 40°F or lower unless absolutely necessary. Sash and door members must be well cleaned of dust with a brush or cloth dampened with turpentine or mineral spirits. Lay a continuous 1/16-inch thick bed of putty or compound in the putty run. The glazed face can be recognized as the side on which the glass was cut. If the glass has a bowed surface, it should be set with the concave side in. Wire glass is set with the twist vertical. Press the glass firmly in place so that the bed putty will fill all irregularities.

When glazing wood sash, use two glazier's points per side for small lights and about 8 inches apart on all sides for large lights, (Figure 10). Replacing glass in a metal sash is a little different from working with a wood sash. When you remove the old putty from the sash, you must locate and save the metal glazing clips. Look at the glazing clip shown in Figure 11. This clip fits between the edge of the glass and the frame. One end of the clip fits into a hole in the frame and the other end hooks over the edge of the glass. Allow for the thickness of these clips when you cut the new glass. Place a bed of putty on the frame and press the new glass gently against it. Use a screwdriver to install the glazing clips. The clips will hold the glass in place while you are applying the beveled layer of putty around the edge of the glass.

After the glass has been bedded, lay a continuous bead of putty against the perimeter of the glass-face putty run. Press the putty with a putty knife or glazing tool with sufficient pressure to insure its complete adhesion to the glass and sash, (See Figure 12). Finish with full, smooth, accurately formed bevels with clean-cut miters. Trim up the bed putty on the reverse side of the glass. When glazing or removing interior sash and transoms, whether fixed or movable, and interior doors, use wood or metal glazing beads. Exterior doors and hinged transoms should have glass secured in place with inside wood or metal glazing beads bedded in putty. When setting wire glass for security purposes, set wood or metal glazing beads, secured with screws, on the side facing the area to be protected.

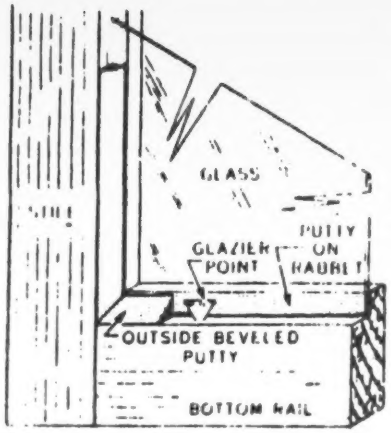

STILE
GLASS
GLAZIER POINT
PUTTY ON RABBET
OUTSIDE BEVELED PUTTY
BOTTOM RAIL

Figure 10. Glass Installed in Wood Sash

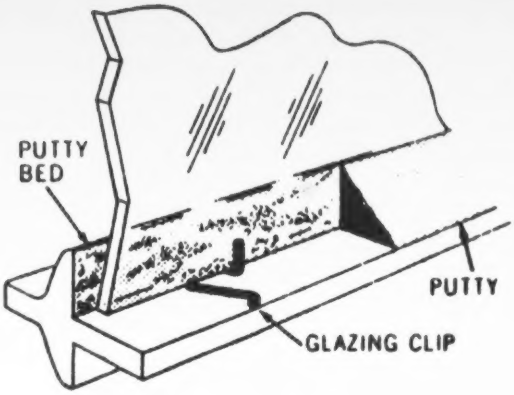

PUTTY BED
PUTTY
GLAZING CLIP

Figure 11. Glazing Metal Sash

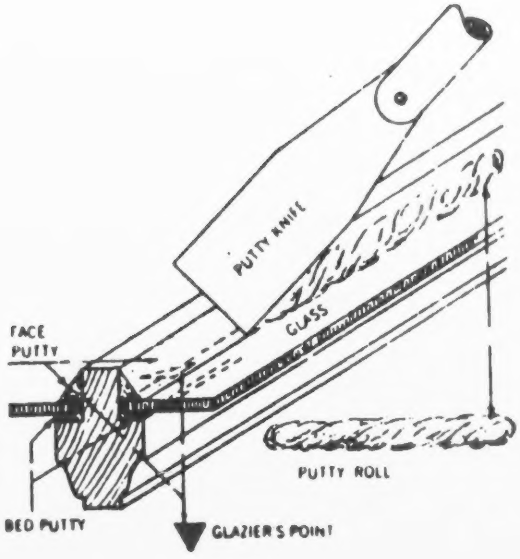

PUTTY KNIFE
GLASS
FACE PUTTY
PUTTY ROLL
BED PUTTY
GLAZIER'S POINT

Figure 12. Setting Glass with Glazier's Points and Putty

Clean the glass on both sides after glazing. A cloth moistened with mineral spirits will remove putty stains. Ammonia, acid solutions, or water containing caustic soaps must not be used. When scrapers are used, care should be exercised to avoid breaking the seal at the putty edge.

Handling and cutting glass creates a serious safety hazard. Leather gloves and goggles must be provided and used. Adequate procedures for the disposal of cutting and broken glass must be established and followed.

Window and Door Screens

In most climates and geographical areas, buildings which are used primarily for the housing of personnel - for either residence or work - are normally provided with screens to cover the windows and doors. These screens prevent the entry into these buildings of insects, and they also protect the window or door glass from breakage. The screens are built on a frame so they may be installed and removed separately as desired. The frames are made to fit into the outside casings of the window or door, as shown in Figure 13. Similar materials are used in door and window screens, except that the screen doorframes are usually heavier and stronger. An additional use of screens is for enclosing porches. In these cases, a special framework is constructed to hold the screens. Window and doorframes may be purchased or made in the shop to fit. You need to know the procedures for installing and repairing screens, since they easily deteriorate when exposed to the weather and frequently are damaged when removed, installed or stored.

Screen Materials

Much of the screening found on Air Force buildings is made of comparatively short-lived steel or iron wire, either painted or galvanized. Continued use of such screen fabric is not recommended for other than planned short-time use of structures. Especially do not use steel or iron wire screening in tropical zones. Instead, experts recommended the use of corrosion and weather resistant material, such as copper, bronze, aluminum or plastic for most future screening needs. Large diameter (0.015-inch) metallic wire will give longer service in tropical areas, where excessive condensation and salt air are encountered. Such experts recommend the use of bronze wire, Type C, in barracks, dining facilities and similar building a where rough usage may be expected. The experts do not recommend using commercial bronze, better known as Type B in tropical areas, however.

Woven screen fabric with strands of any of the following preferred materials is acceptable:

- Copper, Type A; Bronze, Type C; Aluminum, Type G
- Iron or steel, Type D or H, galvanized, japanned, or painted (for employment on buildings planned for limited use, except in tropical zones).
- Nylon
- Plastic, Vinylidence Chloride

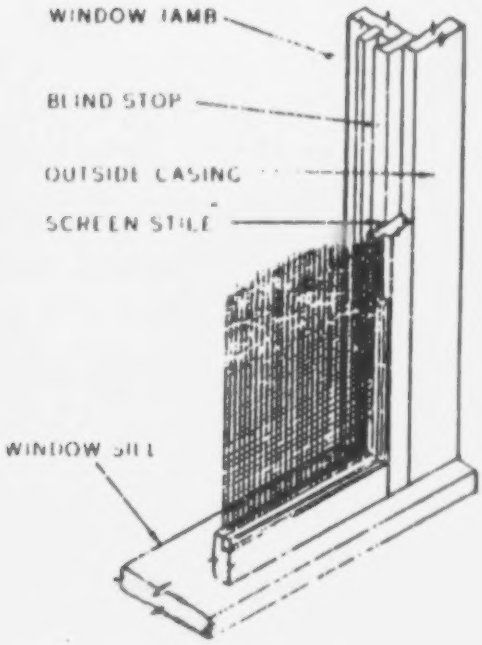

WINDOW JAMB
BLIND STOP
OUTSIDE CASING
SCREEN STILE
WINDOW SILL

Figure 13. Window Screen

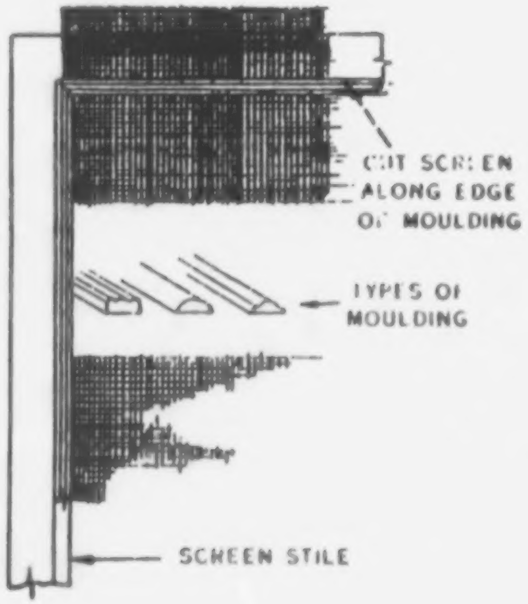

CUT SCREEN ALONG EDGE OF MOULDING
TYPES OF MOULDING
SCREEN STILE

Figure 14. Trimming Window Screen

Screen fabric is recommended for tropical areas. This is the 16 X 16 mesh per inch type, made of 0.015-inch diameter strands, with opening size not greater than 0.0475-inch. Other screen material of 18 X 18 mesh with 0.011-inch strands is suitable for most locations.

Repairing Screens

Tighten loose screens by removing a piece of molding and stretching the screen into place. You may repair small holes in the screen by patching. Use like materials when patching - bronze on bronze, and aluminum on aluminum, ect.

Screen wire is applied to the frame in many different ways. One satisfactory method is to place the frame on a flat surface and unroll the screen wire on the frame. Fasten it in place with small staples placed approximately three inches apart. For best results, stretch the wire by hand while nailing it to the frame. Wire which is stretched too tightly may bend the stiles and rails or tear the wire. Complete the installation of the screen wire by placing a small decorative molding over the edges of the wire, using 2d casing nails. Miter the corners of the molding for a neater appearance. You can use a linoleum knife to trim the screen wire flush with the outside of the molding as shown in Figure 14.

Especially where traffic is heavy, you may prevent sagging of screens on screen doors by installing pushbars and wire guards on them. Place the pushbars of wood or metal about 45 inches above the floor, where the screen is most likely to be pushed when you are opening the doors. Wire guards cover the screen area between the lock and bottom rails. The guards may be prepared of 1/2-inch square mesh, 19-gage steel wire, or 1-inch diamond mesh woven from 16-gage steel wire. Prefabricated ornamental guards may be purchased. Set these guards against the screen and firmly secure them at all edges.

Maintenance and Repair of Wood Windows

General. Window failures may result from various causes, the most common of which are binding of parting or stop beads; windows forced out of shape by settling, shrinking or twisting of the building; swollen or improperly fitted sash; broken or unequal length sash cords; and sash stuck by paint in pulley stile.

(1) Binding. When it is determined that the sash in a double-hung window binds because of pressure against the parting bead, thorough waxing of parts in contact prevents much unnecessary labor. Binding of horizontal sliding sash is also relieved by this procedure. When the inside stop beads of a double-hung window press too tightly against the sash, reduce thickness of beads by planning, sanding, or scraping along the edge adjacent to the sash or move beads farther from the sash. Carefully plane top or bottom rail to relieve binding in horizontal sliding sash. After planing, coat sash with linseed oil and wash when oil has dried.

(2) Settlement. Careful nailing frequently restores shape of frames which are forced out of shape by settling, shrinking, or twisting of the building. Cutting sash is not recommended as a remedy.

(3) Swelling. Do not cut any window which will resume its original size when properly dry. Cut or plane a sash or frame which is swollen due to moisture only when it is determined that the member is too large, even when dry. Remove and plane a sash whose vertical edge binds against pulley stile or running face of window frame. To locate high spots on the sash, rub sash stile with chalk and then slide sash from closed to open positions two or three times. High spots on sash are indicated at points where the chalk is rubbed off.

(4) Bowing. Occasionally a parting bead becomes too long, causing a bow in the middle. In this case, remove bead from frame and cut 1/8 to 1/4-inch from one end.

(5) Broken Cords. Broken or missing cords call for careful removal of stop bead. Remove lower sash from the frame. Knot cords to prevent them from running through pulley after window is detached. Remove parting bead to remove upper sash. Install new cord, then replace upper sash, parting bead, lower sash and stop bead in that order. An economical and efficient substitute for a broken cord or pulley is the sash control spring shown in Figure 15. This spring can also be used in lieu of barrel bolts and other devices for the control of non-balanced sash. Proper sash operation requires that the sum of the two edge clearances be from 1/8 to 3/16-inch. When installing the control springs on new sash or old sash removed from the frame, nail a spring to each edge below top rail of upper sash, or 6 inches below check rail or lower sash. Use to 16 gage, 3/4-inch long brads for each spring. When installing the spring on in-place sash raise lower sash at high point, hold spring with prongs toward frame. Push spring up between sash and frame, using enough pressure to flatten out top spring curve to permit it to slide upwards. Install spring on opposite side of sash in same manner. Lower upper sash to low point and follow same installation instructions as above, except spring is pushed downward. No nails or screws are required.

(6) Balancing Adjustment. When a sash with spiral or pullman type balances is out of balance, follow manufacturer's directions for balance adjustment. Attempts to repair such sash without compliance to prescribed directions may result in further damage.

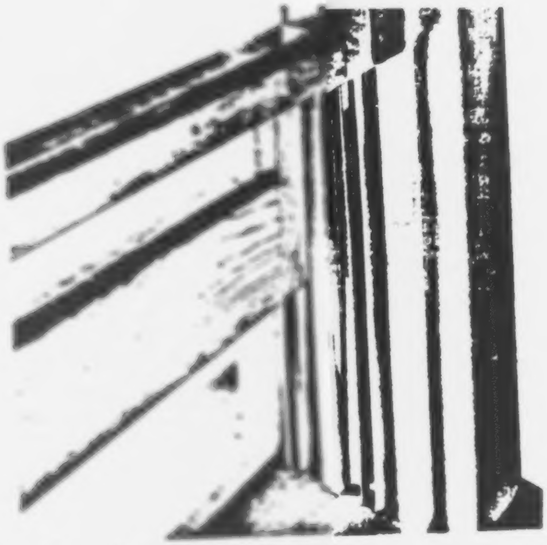


Figure 15. Installed Sash Control Springs.

Maintenance and Repair of Metal Windows

Maintenance and repair of metal windows is usually considerable less than that for wood. General repair is similar to that for metal doors. Rusting, warping and sticking of operating devices are the most common failures. It is important to lubricate mechanisms regularly and to keep fastening devices secure. Problems of alignment caused by building settlement must be adjusted in conjunction with overall corrective measures which may involve stabilizing the foundation and framing. Culking must be maintained in good order to prevent leakage of moisture and air. Typical metal window installations are shown in Figure 16.

Figure 16. Typical Individual Metal Window Installation.

WINDOW INSTALLATION

Before installing a window, check the rough opening. It must be the correct size, plumb and level. If you were given manufacturer's directions with the window unit, follow them. If board sheathing was used at the rough opening, tack building paper around the rough opening. This will reduce air infiltration. Place the window in the opening and secure it temporarily. Use extra props if you are in a windy area. Place wedge blocks under the sill and raise the window to the proper height. Ensure the frame is level by adjusting wedges. Nail through lower end of side casing to secure bottom of frame. Plumb side jambs by using a level and use a framing square to check the corners. Drive nails temporarily into top of side casing. Ensure the entire window is square and level. Open the window to ensure it operates correctly. Make adjustments if necessary. If window operates smoothly, nail the window permanently in place with casing nails. Nail spacing should be approximately 16" O.C. Nails must be long enough to penetrate well into the building frame. Use a nail set for the last driving strokes to sink the nail head below surface.

SUMMARY

Window and screen repair and installation is an important task. The proper use of your skills will create a more comfortable atmosphere to work and live in.

ASSIGNMENT

Unit 11, page 297 answer questions 1-14. Do not write in the textbook.

DOORS AND DOOR HARDWARE

OBJECTIVES

a. Given incomplete statements, identify the procedures for installing, replacing or repairing doors, door trim, and door hardware.

b. Given procedures, materials, equipment, a rough opening for an exterior door and working as a member of a team fabricate and install an exterior door frame and exterior door with no more than five instructor assists. The door frame must be within ± 1/16" of plumb and level and the door must operate without binding.

c. Given procedures, materials, equipment, a rough opening for an interior door and working as a member of a team install the interior door frame and door with no more than five instructor assists. The door must be within ± 1/16" of plumb and level and the door must operate without binding.

d. Given procedures, an exterior door, a framed opening, tools, materials, equipment and working as a member of a team install door trim with no more than five instructor assists. Door trim must fit smoothly.

e. Given specifications, an installed exterior door, materials, tools, equipment and working as a member of a team install weather stripping with no more than five instructor assists. Weather stripping must allow door to close and seal out air around door edges.

f. Given a damaged exterior door, materials, tools, equipment and working as a member of a team repair the door with no more than five instructor assists. The door must present a smooth and neat appearance, fit into the door frame and operate without binding.

g. Given specifications, an exterior door hanging in an opening, materials, tools, equipment and working as a member of a team install door locks and closers with no more than two instructor assists. Locks must allow door to close and latch tightly. Closures must enable door to close smoothly without slamming.

INTRODUCTION

Doors provide a building with an access and also provides security. A correctly installed door can add to the beauty of the structure.

INFORMATION

Once the subsiding and sheathing paper (if require) has been installed, you should again go back and check the engineer's drawing. Especially check the window and door schedule to see what types of doors, windows and ventilators are to be used and how they are to be installed. That is, determine whether they are to be installed after or before the finish siding has been applied. For example, most aluminum and wood window units are installed before the finished siding has been applied, while some units (especially some local shop built units) are installed after the finish siding has been applied. This is the reason why you should always follow your drawings closely: To prevent errors in construction. Since the majority of doors, windows and ventilators are installed before the finish siding, we will discuss them here first.

Exterior Doors. It is probable that you will spend more time installing and performing maintenance on outside doors than on any other portion of buildings. Their outside location, exposing them to the effects of the sun,

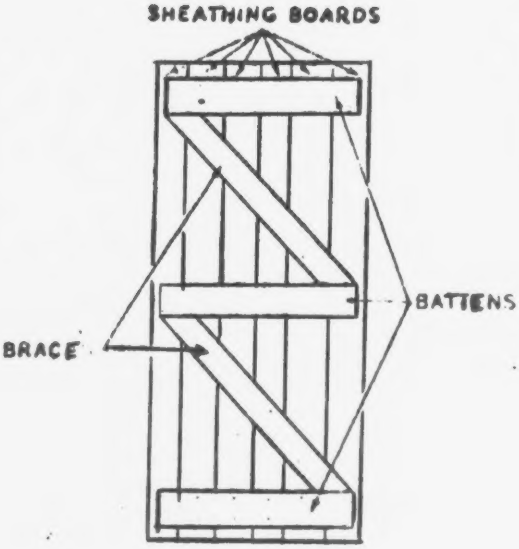

SHEATHING BOARDS
BATTENS
BRACE

Figure 17. Batten Door

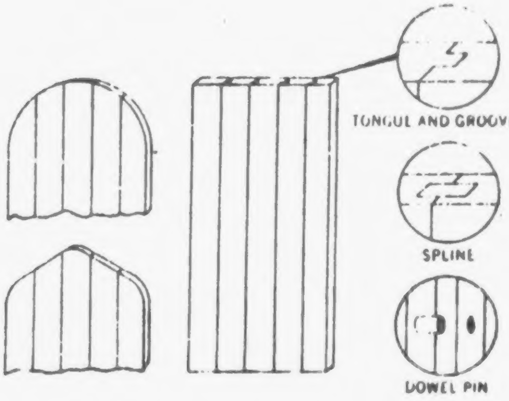

TONGUE AND GROOVE
SPLINE
DOWEL PIN

Figure 18. Solid Door

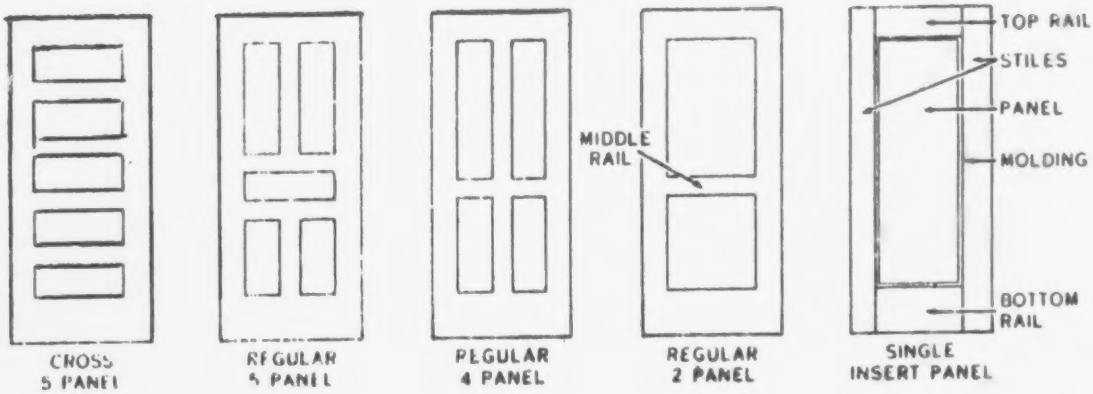

CROSS 5 PANEL
REGULAR 5 PANEL
REGULAR 4 PANEL
MIDDLE RAIL
REGULAR 2 PANEL
TOP RAIL
STILES
PANEL
MOLDING
BOTTOM RAIL
SINGLE INSERT PANEL

Figure 19. Panel Doors

rain, wind and ice, causes them to deteriorate. This deterioration is one reason for continued maintenance of such doors. Another is the deterioration caused by the wear of day-after-day use and misuse. You must therefore be thoroughly informed as to the proper methods for installing, adjusting and repairing these important building units.

If doors are properly installed, a considerable amount of maintenance can be prevented. Also, in addition to the satisfaction given the users of a building, good door installation will reduce the costs of heating and cooling.

TYPES OF DOORS

Many kinds of exterior doors are in use. They may be classified, according to the way they open and close, as swinging or sliding doors. Doors are also classified by their construction featuers, such as batten, solid, panel or flush types. There are many variations of each of these type due to the size, strength and ornamental requirements where they are used.

Batton Doors

These doors are built of sheathing-type boards which are held together with battens fastened across them as shown in Figure 17. You will probably make this type of door on the job. The sheathing boards may be placed either vertically or horizontally. The battens are placed at right angles to the sheathing boards and, in addition, diagonal braces are used to prevent the door from sagging. These doors are used where openings are odd-sized on sheds or other buildings if appearance is not of major importance.

Solid Doors

Solid doors are made similar to batten doors except that they are fastened and braced internally. They are usually made from materials of the approximate thickness of 2-inch finished boards. The boards are held together with glue and by fastening with dowel pins, splines, or tongue and grooving as illustrated in Figure 18. You may cut these doors in various ways to fit odd-shaped openings. These doors are strong and durable but are quite heavy. Also, they are subject to warping unless they are well made, because there are no bracing members spanning the width of the door.

Panel Doors. ..ese doors are probably the most commonly used. They are made up of stiles (vertical members), rails (cross members), and panels. The number and shape of the panels vary considerably, as shown in Figure 19. Any of the panels may be of either wood or glass.

Flush Doors

Flush doors are perhaps the most desirable for present-day construction. These doors have either a solid core of soft wood or a hollow core made up of grids as illustrated in Figure 20. The core usually has stiles and rails similar to those in a panel door. Plywood is laid over the core to provide a smooth surface on each side. The edges of these doors are covered with the same type of wood as the side surfaces. Advantages of this type of door are that they may be economically made to resemble more expensive and massive doors, yet are relatively light in weight and easy to support by the hinges.

Regardless of the type of door to be used, it will usually be necessary for you to prepare or install a door frame within the "rough" opening. Properly installing the door frame is another step in making door fitting easier and in reducing future maintenance.

Exterior Door Frames

Door frames can be purchased commercially as units, or you may build them in the local carpentry shop. Purchased frames may come assembled and ready for installation, or they may come in knocked down (KD) bundles that you put together on the job. Although all door frames include certain parts, the details of each part can vary. Exterior door frames are made up of two side jambs, a head jamb, an outside casing, and a sill, as shown in Figure 21. The drip cap and inside casing are sometimes included as parts of the door frame. These parts are precision cut, dadoed and carefully put together to make a complete door frame.

A rabbeted door jamb is a construction detail that is normally limited to exterior door frames. Figure 22 illustrates the 1/2-inch by thickness-of-the-door rabbet which is provided to form a stop for the door to close against. When you are ordering or making a frame for an external door, you must consider the factors of the thickness of the door, the height of the door, the width of the door, and the thickness of the wall into which it is to be installed.

Installing Exterior Door Frames

When the door frames are first delivered to the job site, they should get a prime coat of paint to keep out moisture and prevent them from warping. Also, before you set a door frame, square and brace it. Even though you get a door frame with all of the braces in place, there may have been some movement due to a great deal of handling. When you are sure that the frame is square then you can get on with setting the frame as follows:

- Check the dimensions of the frame and compare them with the dimensions of the rough opening. Also, take notice as to how the frame will set in the opening. In platform-frame construction. for example, the sill and the bottom ends of the side jambs rest on the subflooring. In balloon-frame construction, a sill header must be framed between the trimmer studs, flush with the outer faces of the studs, to support the door sill and the lower ends of the side jambs.

- Tack a strip of heavy building paper 10 to 12 inches wide against the sheathing around the rough wall opening.

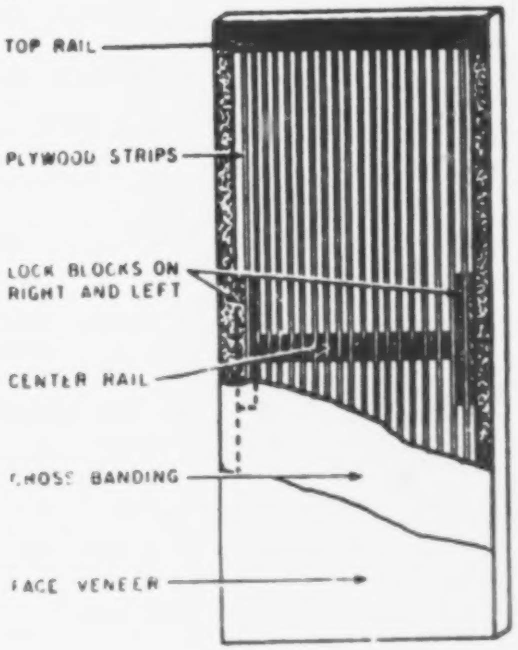

TOP RAIL
PLYWOOD STRIPS
LOCK BLOCKS ON RIGHT AND LEFT
CENTER RAIL
CROSS BANDING
FACE VENEER

Figure 20. Flush Door

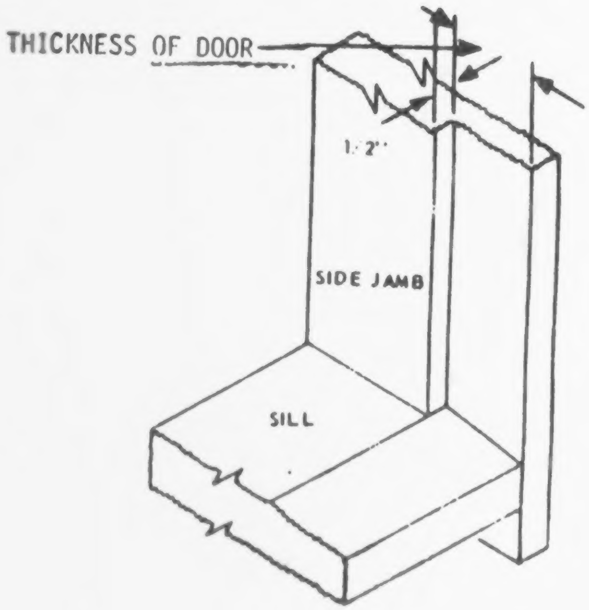

THICKNESS OF DOOR
1/2"
SIDE JAMB
SILL

Figure 22. Rabbeted (plowed) External Door Jam

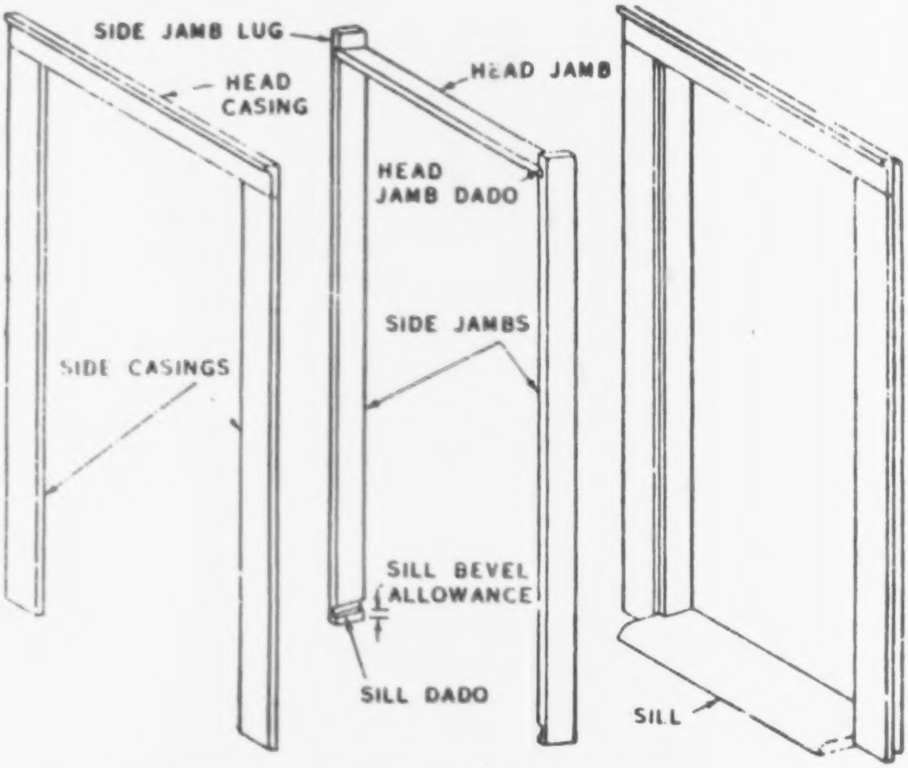

SIDE JAMB LUG
HEAD CASING
HEAD JAMB
HEAD JAMB DADO
SIDE JAMBS
SIDE CASINGS
SILL BEVEL ALLOWANCE
SILL DADO
SILL

Figure 21. Principle Parts of a Door Frame

- Set the frame at the center of the opening and temporarily brace it to prevent it from falling out while you are adjusting it.
- Level the sill by placing wedge-shaped blocks (cypress wood shingles, if available) under the side being raised. Important: The top of the sill must be level with the finished floor when it is installed, as seen Figure 23.
- Place wedges along both sides of the jamb keeping the frame approximately center of the opening at key stress points, as shown in Figure 24.

That is, place wedges behind hinge and lock locations in addition to any other wedges needed.

- An 8d finishing nail driven through the casing into the wall at the bottom of each side will hold the frame in place. When you fasten the frame in position, do not drive the nails completely into wood until you place all nails and make a final check to determine whether or not readjustment is necessary.
- Check both sides of the frame by placing a level against the inside of the jambs. This will show whether or not the frame is plumb. A nail driven through the casing near the top on each side will then hold the frame in position. After fastening the frame at the top, make a second check to ensure that the sides are plumb and the head jamb is level. When the sides are plumb and the top is level, all the corners of the frame should be square.
- Finally, securely fasten the frame with 8d finishing nails placed 3/4 inch in from the outer edge of the casing and spaced 16 inches apart. Set all nails below the surface of the wood.

FINISH HARDWARE

Hardware that has a functional and/or ornamental purpose, such as hinges, pulls, knobs, locks, closers, etc., are classed as finish hardware. This class of hardware is so large it would be very difficult to cover it completely, hence, this chapter will include only the most commonly used items.

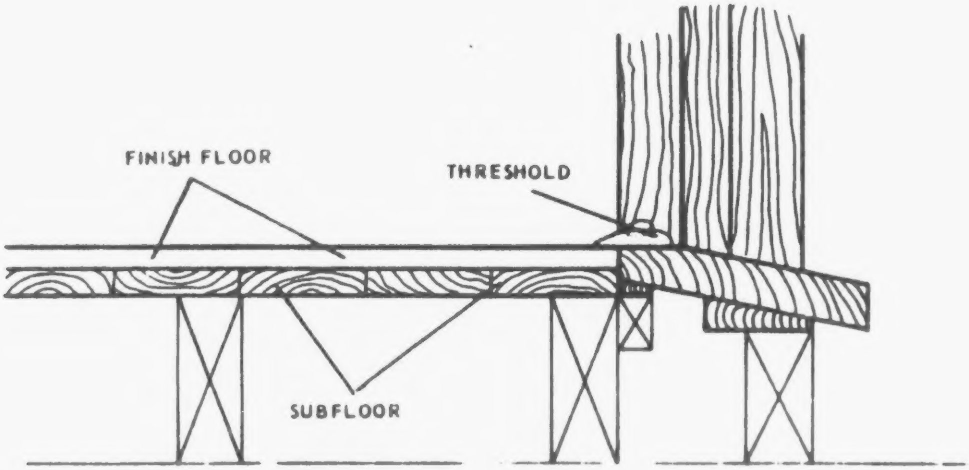

FINISH FLOOR
THRESHOLD
SUBFLOOR

Figure 23. Adjusting a Door Sill

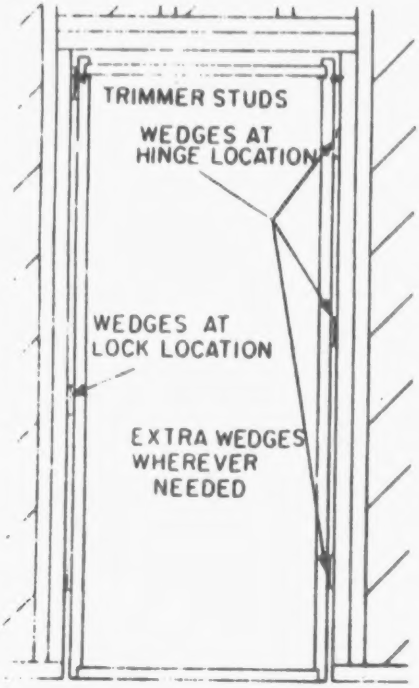

TRIMMER STUDS
WEDGES AT
HINGE LOCATION
WEDGES AT
LOCK LOCATION
EXTRA WEDGES
WHEREVER
NEEDED

Figure 24. Adjusting a Door Frame

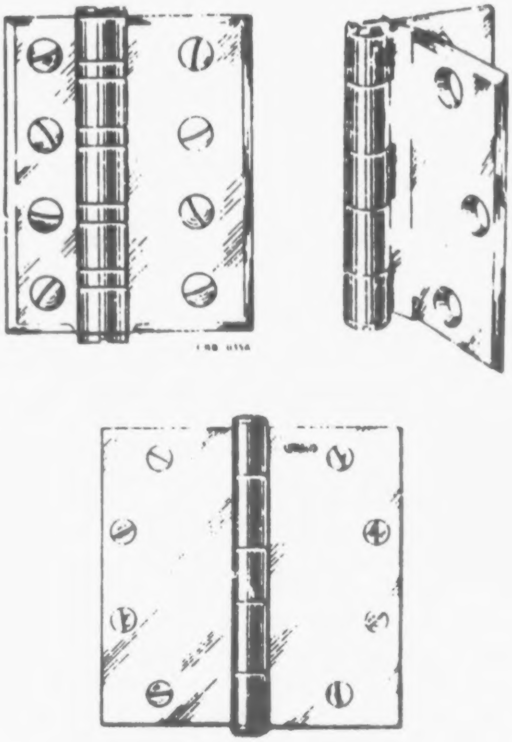


Figure 25. Hinges

We touched lightly on hardware early in the unit when we covered door installation and other areas which require this type of equipment. This chapter will go into more detail.

A large percentage of the carpenter's work will involve maintenance and minor repair of hardware items which we still discuss in this chapter.

Hinges

Many different types, styles and sizes of hinges are used by the carpentary specialist. They are, however, all used to make a moveable joint between two pieces of material. Hinges are made of different metals and finishes for various uses.

Butt Hinges

Butt hinges are usually mortised into the jamb and the edge of the door or are applied fully to the surface, depending on the type of hinge that is used. Hinges are made for surface mounting or full mortise mounting. A mortised hinge is fully hidden, except for the barrel, when the door is closed; while surface hinges are half or full exposure. Figure 25 shows the various types of butt hinges.

The round center part of the butt hinge is the barrel, the flat parts are the leaves. The two leaves are held together by a pin running through the barrel.

Butt hinges may have either square or round corners, as illustrated in Figure 27. The square corners are used when the gains (mortises) are chiseled into the door and jamb; whereas the round corners are used when a router is used to cut the gains.

Butt hinges also differ in that some are swagged and some are not. Swagging, is shown in Figure 28. The square corners are used when the gains (mortises) are chiseled into the door and jamb; whereas the round corners are used when a router is used to cut the gains.

Butt hinges also differ in that some are swagged and some are not. Swagging, as shown in Figure 28, is a slight offset of the hinge leaf at the barrel which permits the leaves to come closer together when closed. A swagged hinge leaves a small crack between the door and the jamb.

Loose Pin Type Hinges

The loose pin type of hinge is used when ease of door removal is desired; while solid pin types are used where removal of the pin is not a requirement.

Loose Joint Hinges

Figure 26 shows the loose joint hinges which are used when fraquent door removal is required.

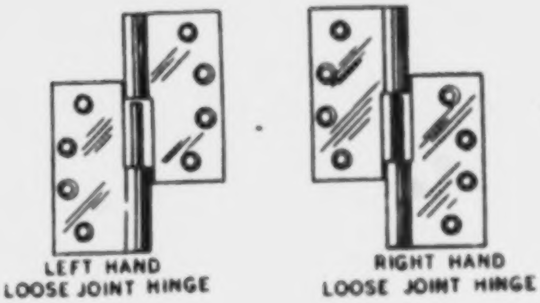

LEFT HAND
LOOSE JOINT HINGE
RIGHT HAND
LOOSE JOINT HINGE

Figure 26. Loose Joint Hinges

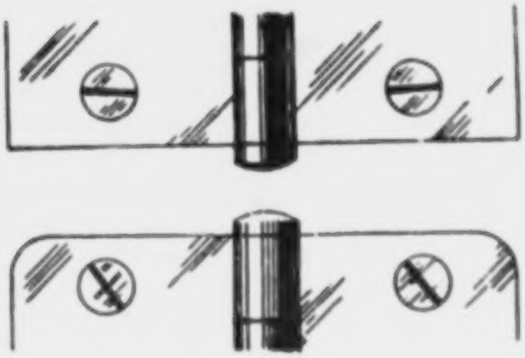


Figure 27. Square and Round Corner Hinges

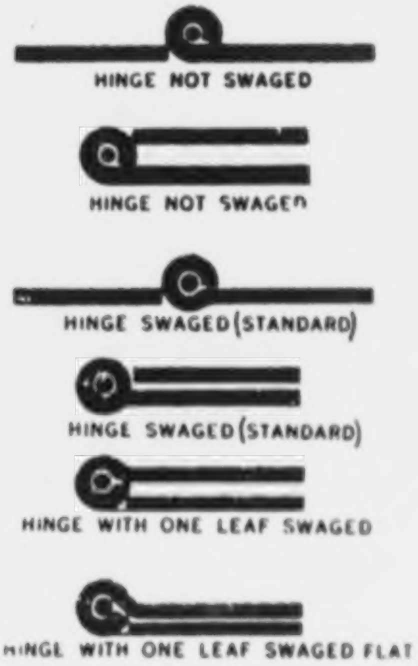

HINGE NOT SWAGED
HINGE NOT SWAGED
HINGE SWAGED (STANDARD)
HINGE SWAGED (STANDARD)
HINGE WITH ONE LEAF SWAGED
HINGE WITH ONE LEAF SWAGED FLAT

Figure 28. Hinge Swagging

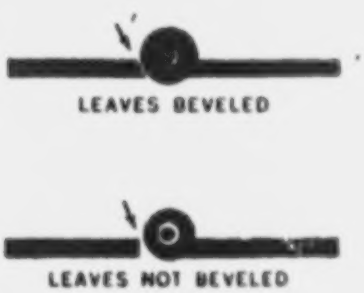

LEAVES BEVELED
LEAVES NOT BEVELED

Figure 29. Beveling of Leaves

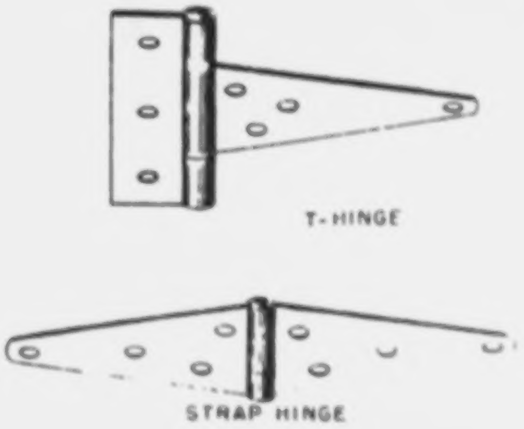

T-HINGE
STRAP HINGE

Figure 30. Utility Hinges

Beveling of the inner edges of the leaves, next to the barrel, makes close fitting joints and also makes a more attractive hinge. Beveling is illustrated in Figure 29.

Utility Hinges

This class of hinge includes the T-hinge and strap hinge, shown in Figure 30. It is used primarily on rough work, such as gates, boxes, batten (storeroom) doors, etc. These hinges are full-surface hinges (both leaves fully exposed) and are mounted with screws or bolts. For a more secure mounting, flat-headed bolts are used.

Special Hinges

This class of hinge provides for many different types of installations. Figure 31 shows these special hinges. Special hinges include:

a. the continuous hinge (piano hinge), which reinforces the door and jamb along the entire length.

b. the screen door hinge, with or without a spring.

c. screw hook and strap or bolt hook and strap, which are used to fasten heavy gates to posts.

Hinge Hasps

A hinge hasp, seen in Figure 32, is made in a manner similar to a hinge; but the leaves are fashioned differently. That is, one leaf has screw holes for mounting, while the other leaf is longer and slotted near the outer end to fit over a heavy metal loop known as the staple. The loop is fastened in place with screws, and the slotted end of the hasp fits over the loop. A padlock fits into the loop to secure a door, gate, locker, etc. As you can see in Figure 32 the safety hasp is the most secure, since all screws are concealed when it is closed.

Cabinet Hinges

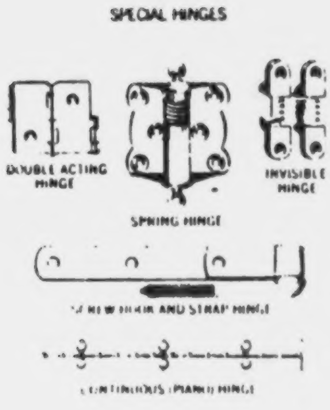
Cabinet hinges are made in many styles and finishes to provide an adequate selection for every type of cabinet and decor. Figure 33 shows several types of cabinet hinges.

Hinge Repairs

Most problems with hinges will occur due to wear-and-tear and the only solution here is repair by replacement. However, you can correct some problems which are not directly the fault of the hinge, and these are discussed next.

For example, you will encounter some situations in which the screw holes become enlarged, thereby causing the hinges to become loose. You can solve this problem by filling the hole and replacing the screw. This can be done in several ways, in fact, one method involves drilling the holes out and gluing dowels into the holes, then putting the screws back into place. Another method, one to use if the door has only two hinges, is to possibly install a third hinge midway between the existing hinges to obtain more strength.

Some light cabinet hinges may become bent. In some cases, these can be straightened. It would be wise for you to inspect the hinge, however, if you find obvious wear, it would be better for you to replace the hinge rather than to repair it.


SPECIAL HINGES
DOUBLE ACTING HINGE
SPRING HINGE
INVISIBLE HINGE
SCREW HOOK AND STRAP HINGE
CONTINUOUS (PIANO) HINGE

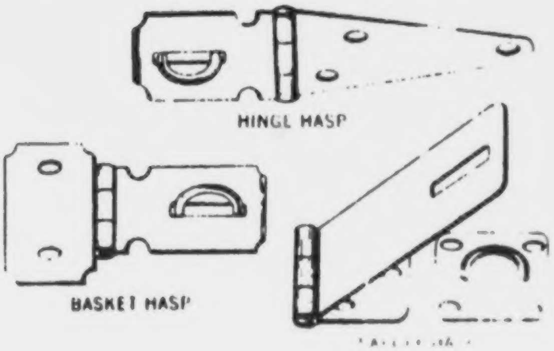

HINGE HASP
BASKET HASP

Figure 32. Hinge Hasps

Figure 31. Special Hinges

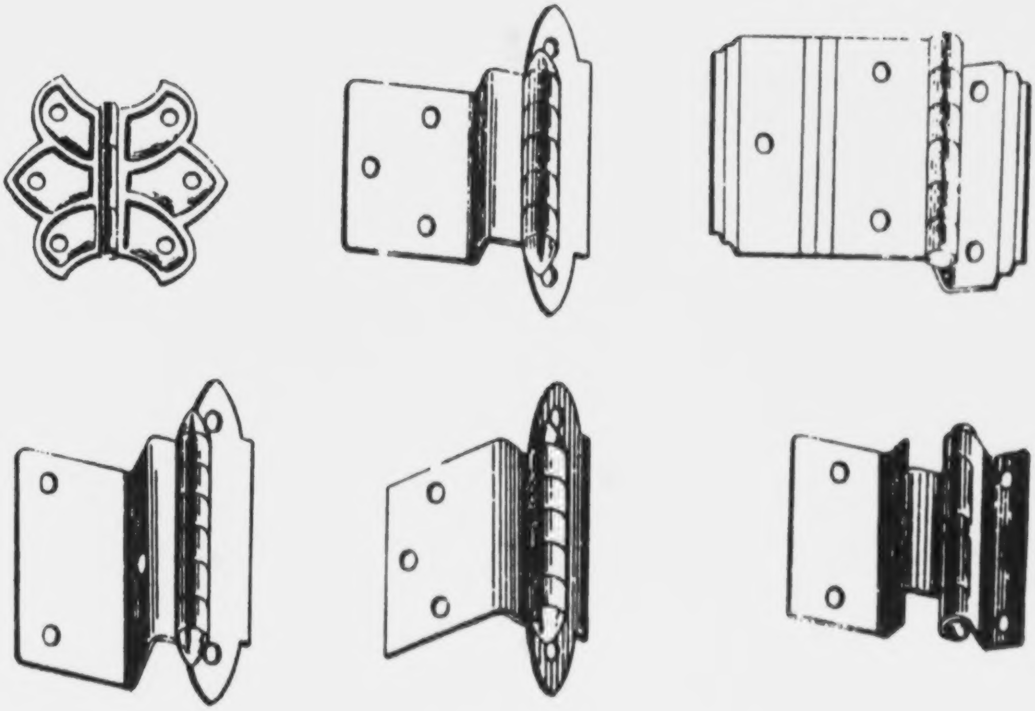


Figure 33. Cabinet Hinges

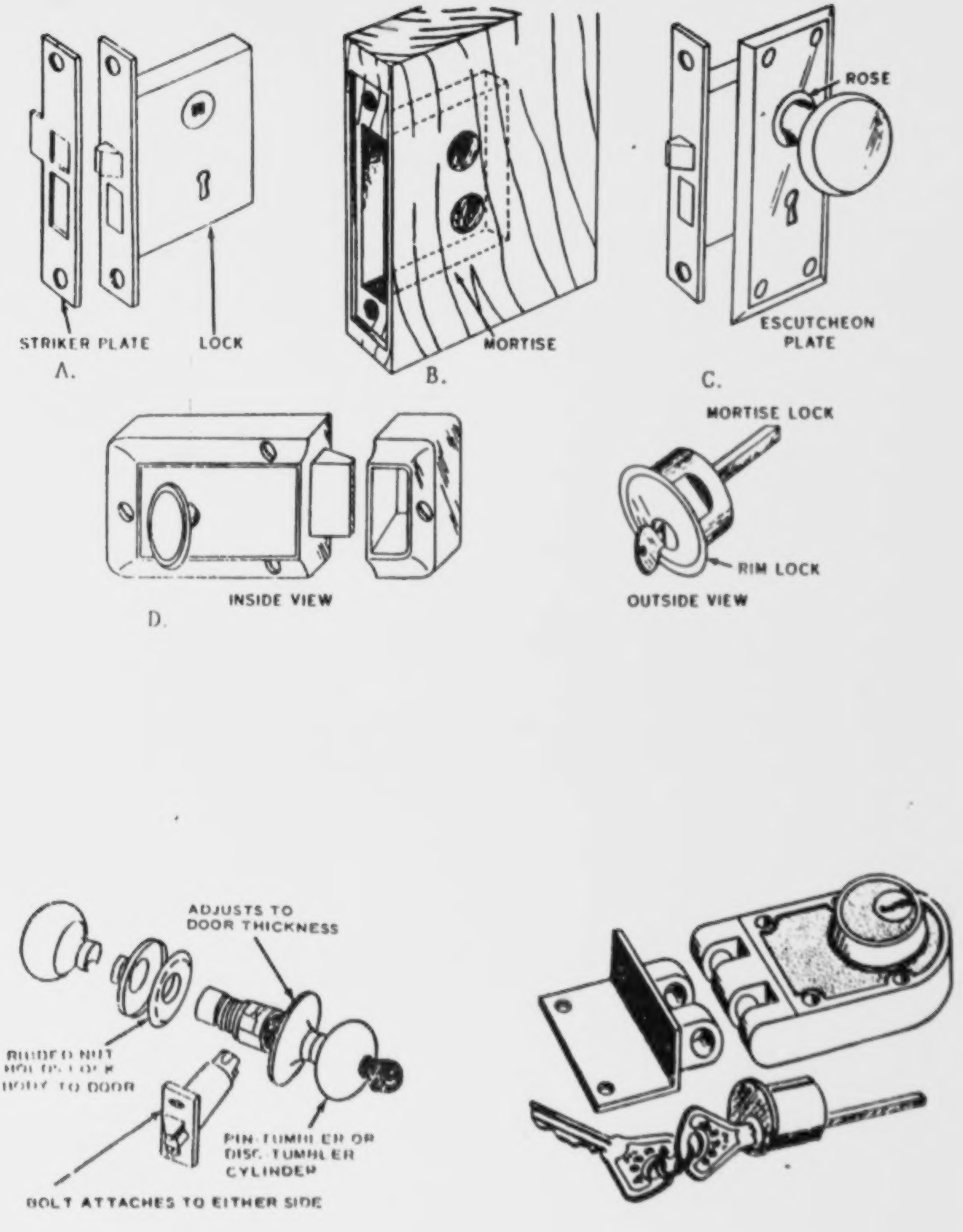
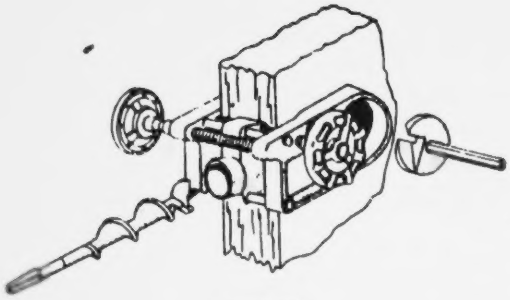
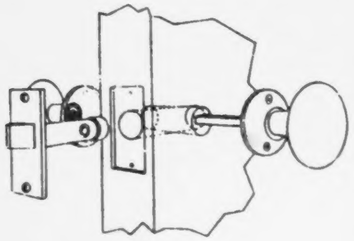

STRIKER PLATE
LOCK
A.
MORTISE
B.
ROSE
ESCUTCHEON PLATE
C.
INSIDE VIEW
D.
MORTISE LOCK
RIM LOCK
OUTSIDE VIEW
ADJUSTS TO DOOR THICKNESS
RIBBED NUT HOLDS LOCK BODY TO DOOR
PIN-TUMBLER OR DISC-TUMBLER CYLINDER
BOLT ATTACHES TO EITHER SIDE
F

Figure 34. Locksets



GUIDE TOOL



TUBULAR LOCK

Figure 35. Tubular Lock and Guide Tool

Hinge maintenance is mostly a matter of judgement; however, the application involved and appearance of the hinge must be taken into consideration when you are deciding whether to replace or repair it.

Do not forget, too, that lubrication is an important factor in prolonging the life of a hinge and keeping it quiet. Be careful when using lubricants, since they can stain carpeting and walls as well as the door and the jamb.

Locking Devices

Locking Devices fall into several categories, including exterior lock sets, privacy lock sets, passage latches, cabinet latches, and exit bolts. The principle of operation of the actual latching mechanism of all of these locking devices is similar, except that some of them, such as passage latches and cabinet latches, do not have a locking mechanism. Locks are further classified as mortise, tubular, cylinder, and rim. Each of these classifications will not apply to all categories of application, however. But look at Figure 34 in the next Learning Objective. It shows several types of locks you should be familiar with.

Exterior Lock Set

These lock sets, examples of which appear in Figure 34, will generally be of heavier construction to provide better security. The locks are operated by a key and will sometimes be a combination dead bolt and entrance lock. Dead bolts are sometimes completely separate from the lock; it is a second lock and can only be opened with a key. The term exterior may be somewhat misleading, since these same locks and dead bolts are often used inside buildings to secure offices, storerooms, equipment rooms, etc. These locks may have thumb latches or knobs or a thumb latch outside and a knob inside.

Exterior lock sets may be of any classification mentioned above; the first class we will discuss is the mortise.

Mortise Lock

The mortise lock, shown in Figure 34A is probably the most difficult to install since the complete mechanism is mounted inside the door, as Figure 34B reveals. This mounting requires the edge of the door to be mortised out sufficiently to accept the lock. Holes must be drilled in the face of the door for the shaft on which the knobs are mounted.

Mortise locks are still widely used; however, they are being replaced of new installations by more modern types.

Cylinder Lock

The cylinder lock set, illustrated in Figure 34E is another type which is widely used for exterior applications. This type can be used in any application where a mortise type could be used.

The cylinder lock is a heavy-duty lock and well suited to applications where better security is required. The key is inserted into the center of the outside knob, and there is usually a button in the center of the inside knob for locking.

Installation of the cylinder lock is simpler than that of the mortise type, since the mounting holes can be bored into the face and edge of the door. A shallow mortise is required for the lock face and striker plate. A dead bolt is often used with this type of lock for added security.

Tubular Lock

Another type of lock used for exterior application is the tubular lock. However, this kind of lock is lightly built and does not provide the security usually desired. The appearance and arrangement of this lock is very similar to the cylinder lock, but the holes for installing it are smaller. Figure 35 shows the method used to install a tubular or cylinder lock.

Rim Lock

Some older buildings use rim locks, but on new buildings these locks are seldom seen anymore. This type of lock is very simple to install, since it only requires two small holes in the face of the door - one for the shaft and one for the key. The entire lock assembly is mounted on the inside surface of the door, and the striker pocket is mounted on the surface of the jamb. As you can probably imagine, this lock is not too secure, since only the screws holding the striker pocket would prevent forced entry.

Some modern dead bolts are still of the rim type; however, they are designed for much more secure mounting. Figure 34 shows this type of lock. The striker is mounted on the inside surface of the door, and a portion of it is mortised into the edge of the door and fastened with screws. This feature makes the lock very difficult to force open. The lock may be key-operated on both sides or have a knob inside.

Interior Lock Sets

The previous discussion of exterior locks will apply in principle to interior locks. However, these locks are normally of a lighter construction and do not have elaborate key locks.

Privacy Locks

Locks used on bathrooms and bedrooms are quite simple and are not designed for great security. The simple lock is engaged by pushing in and turning the knob, or by pressing a button. They can be unlocked from the outside in an emergency, by simply inserting a small stiff wire or similar device into a hole in the center of the knob.

Bathroom locks usually have chrome knobs inside and brass knobs outside, this feature enhances the decor.

Passage Locks

These devices are usually referred to as passage latches, since they have no locking mechanism. Passage latches are used in corridors, between rooms, on closets and other inside applications where no security is required. THey are a means of holding a door shut and making it convenient to open when necessary. The knobs on these latches may be decorative. Closet latches sometimes have no inside knob.

Both the privacy and passage locks are usually of the tubular type; however, mortised or rim types may be found.

Cabinet Latches

These devices come in a variety of types, as illustrated in Figure 36. Other types, too numerous to mention, are available, too. Most of the latches you encounter will be some variation of those illustrated however.

Fire Exit Bolts (Panic Locks)

This type of hardware is installed on exit doors on public buildings for the purpose indicated by its popular name. The doors are opened by conventional means from the outside, while the inside is completely different. Figure 37 illustrates several types of outside hardware and the latching mechanism as well as the panic bar for opening from the inside.

The locking mechanism may be either mortise or surface-mounted. The latching may be at the top and bottom, through a system of vertical rods, or at the center of the door edge. Panic hardware can be used with either single or double doors.

Installation of Lock Hardware

The most important thing you must know when preparing to install door lock hardware is the hands of the doors; that is, whether the door is right-handed or left-handed. This is determined by viewing the door from the outside. The outside of an entrance door is viewed from the street side. A room door is viewed from the corridor side. A door separating two rooms is viewed from the side where the hinges are not visible. The above information concerns doors which open away from you. If the hinges are on the right, it is a right-handed door. If a door opens toward you, again viewing it from the outside, the side with the hinges determines left or right-handedness. Hinges on the right means the door is right-handed. Doors which open toward you require reverse bolts and must be ordered as such.

It would require many pages to cover all of the installation procedures which would apply to all lock hardware. Therefore, you must follow the manufacturer's instructions which are packed with the equipment. These instructions will usually include a template showing the location of holes when required.

Repairing Locks

Lock repairs are the primary responsibility of the locksmith; however, some minor repairs and maintenance can be accomplished by the carpentry specialist.

Locks are similar to hinges in respect to the type of maintenance required.

Screws in the striker plate as well as the lock itself have a tendency to loosen. This is especially true on new installations where the screws were driven in with a hammer instead of a screwdriver. When screws do continually loosen, it may be necessary for you to fill the screw holes with wooden pegs and reinstall the screws.

Another very important service required, to keep locks in good condition, is regular lubrication. This is not to say that you should take an oil can around and oil all of the locks you find. The type of lubrication required for a particular lock depends upon its location and application.

A lock which is located in a position where it will be exposed to extreme weather should be lubricated with graphite, since oil or grease would tend to congeal or melt when the weather changed. To properly lubricate a key lock with graphite, the lock should be removed and postioned to allow the graphite to fall into the lock. The lubricant should be worked into the lock by inserting a key and moving it in and out and turning it.

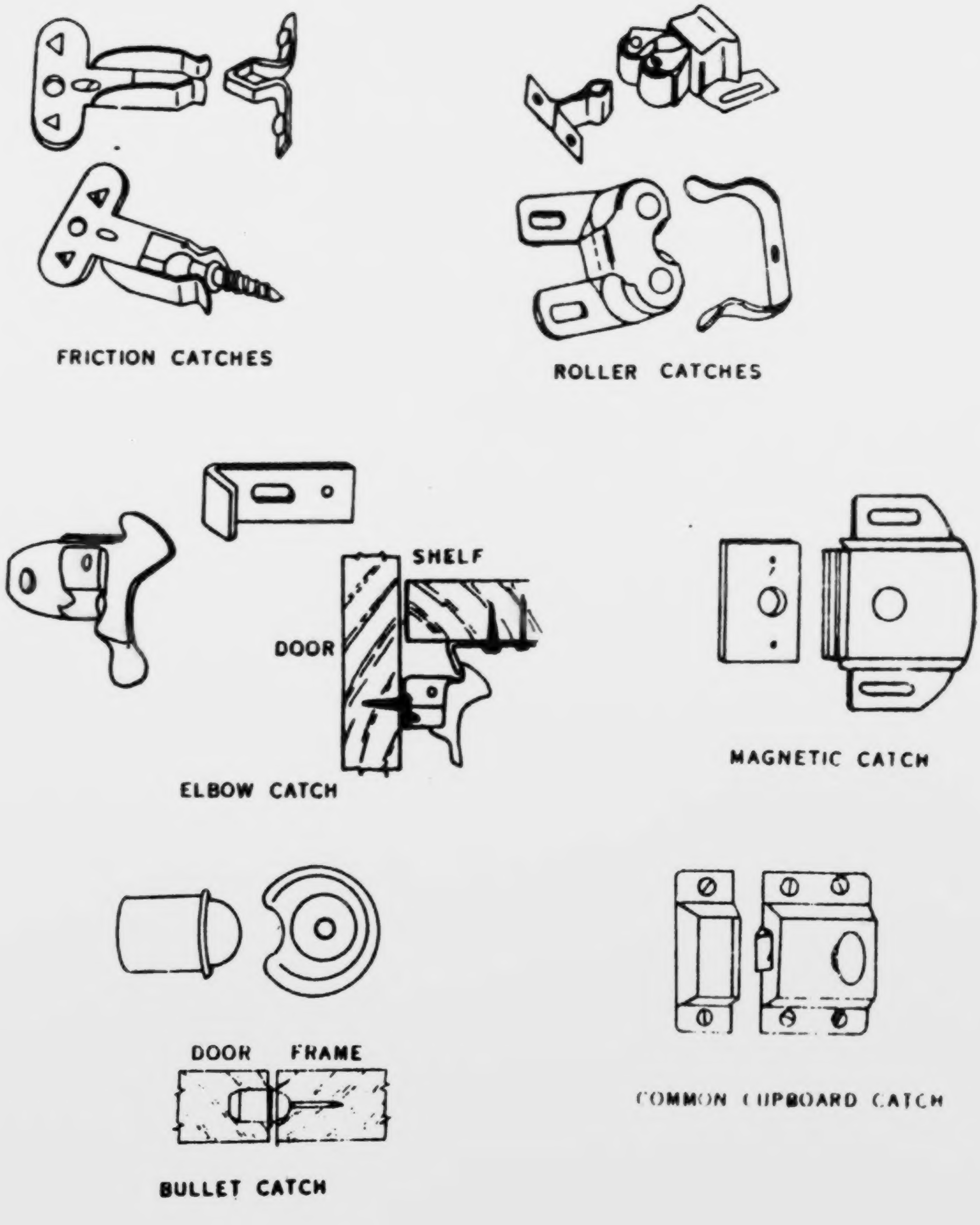
Graphite is always a good lock lubricant, however, silicone spray is also good for interior locks where dust is no problem.

Weather Stripping and Thresholds

Weather stripping and thresholds are two important items of finish hardware. Both are used for the purpose of making buildings weather tight; they also aid in the control of noise, from outside as well as the noise caused by doors slamming.

Weather Stripping

Several types of weather stripping are used on doors and windows and around window air conditioners. Figure 38 illustrates some typical weather stripping.



FRICTION CATCHES
ROLLER CATCHES
SHELF
DOOR
ELBOW CATCH
MAGNETIC CATCH
DOOR
FRAME
BULLET CATCH
COMMON CUPBOARD CATCH

Figure 36. Catches

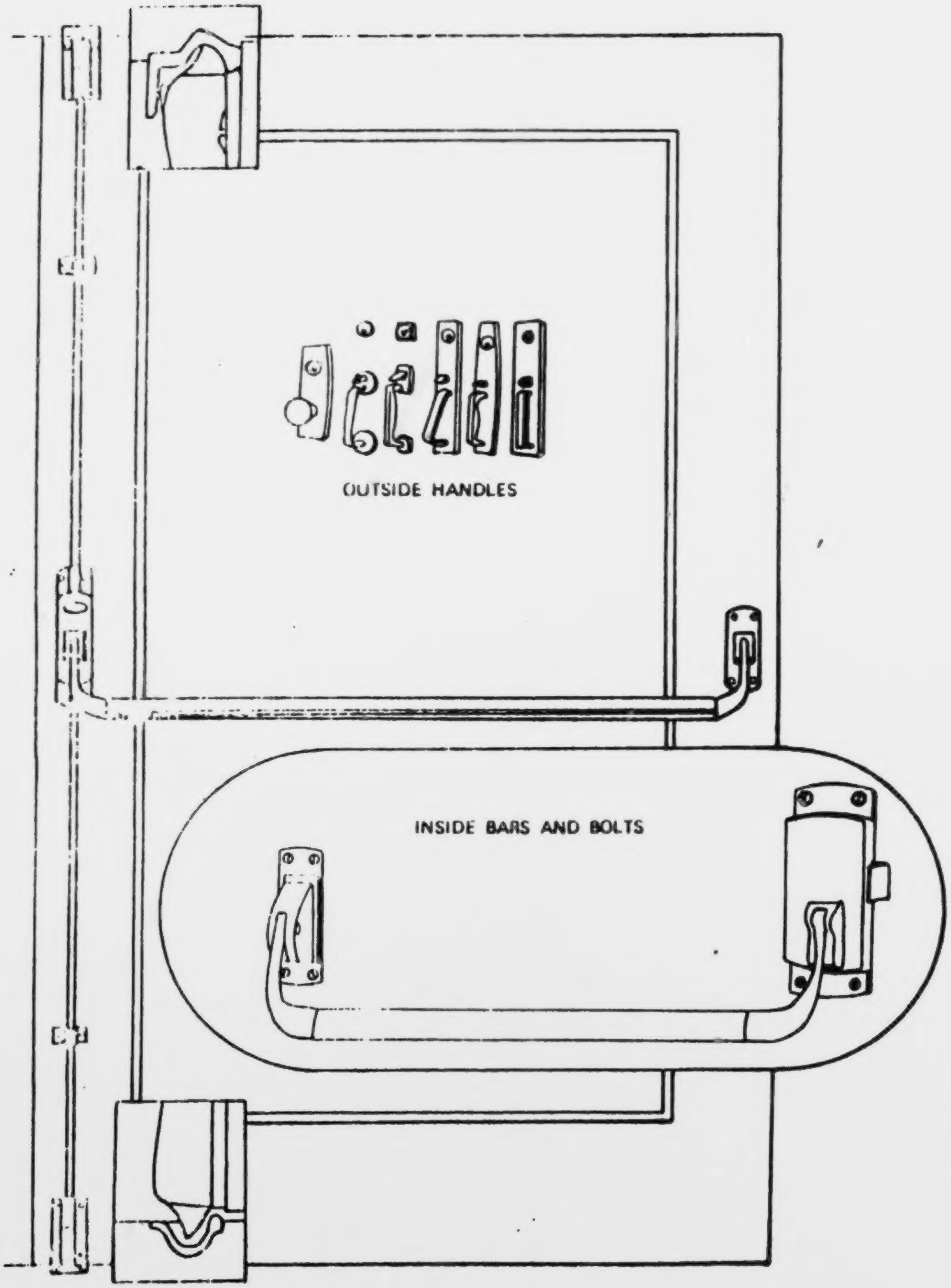

OUTSIDE HANDLES
INSIDE BARS AND BOLTS

Figure 37. Fire Exit Bolts

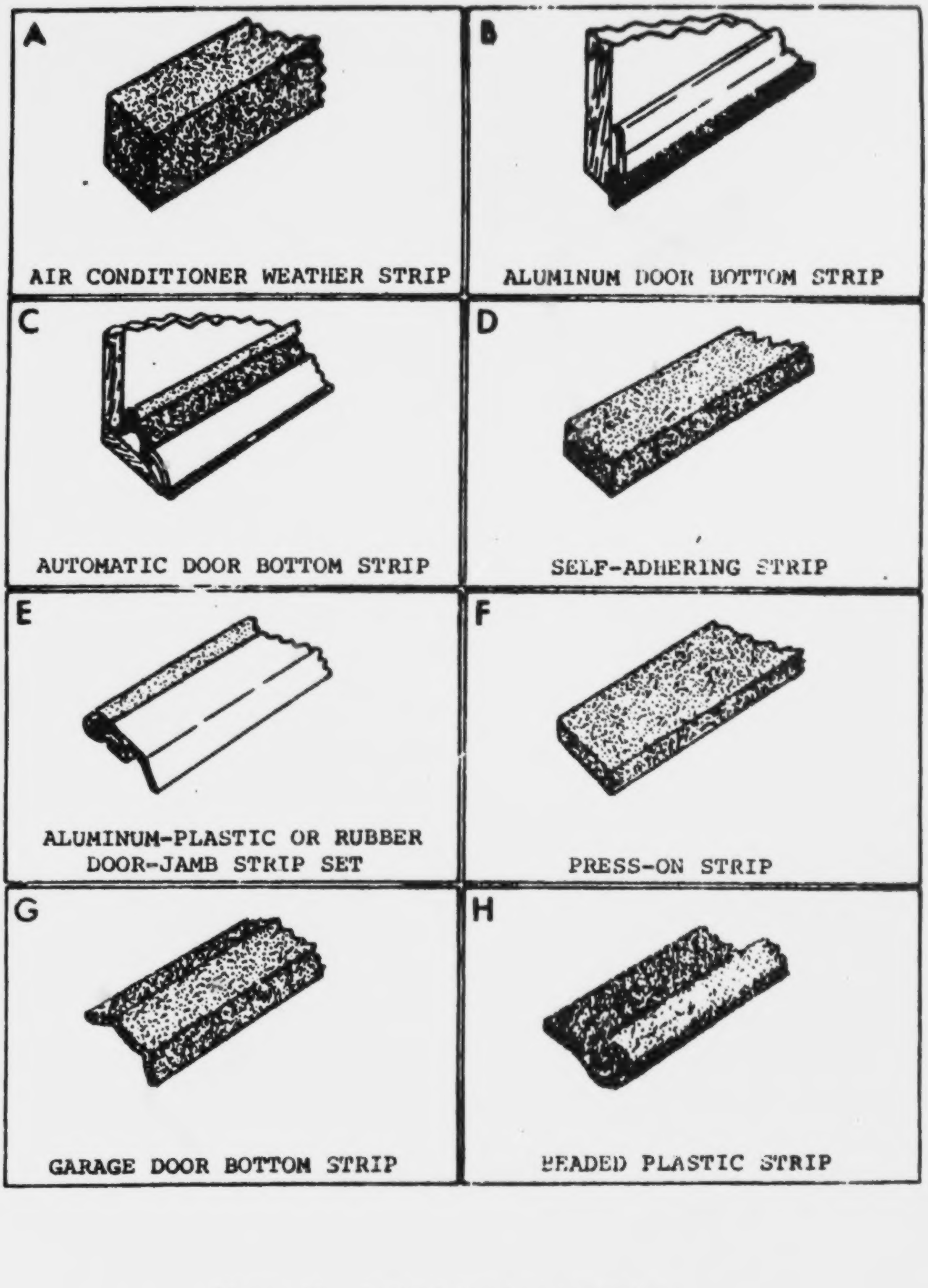

A
AIR CONDITIONER WEATHER STRIP
B
ALUMINUM DOOR BOTTOM STRIP
C
AUTOMATIC DOOR BOTTOM STRIP
D
SELF-ADHERING STRIP
E
ALUMINUM-PLASTIC OR RUBBER DOOR-JAMB STRIP SET
F
PRESS-ON STRIP
G
GARAGE DOOR BOTTOM STRIP
H
BEADED PLASTIC STRIP

Figure 38. Typical Weather Stripping

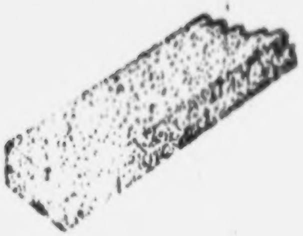


Figure 39. Foam Type Weather Stripping

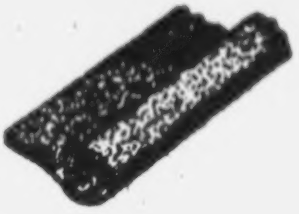


Figure 40. Beaded Plastic Weather Stripping

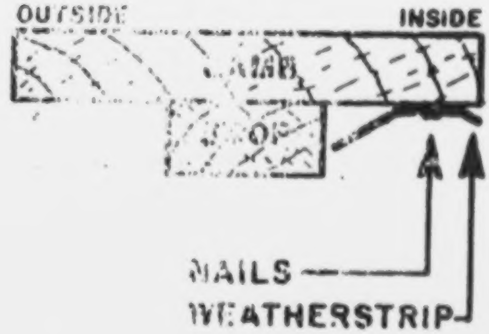


Figure 41. Metal Weather Stripping

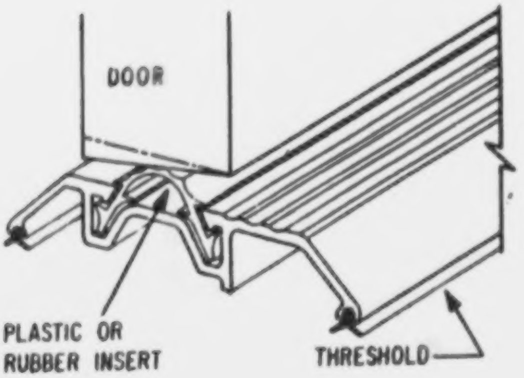


Figure 42. Threshold

All weather stripping functions in essentially the same way; by creating a seal between the door jamb and the door or the window frame and the window.

Installation

The installation of weather stripping depends upon the type. However, with the foam plastic or rubber types which are quite common it is necessary to install the strip on the door stop at the lock side of the door. On the hinge side of the door, the strip must be installed on the jamb; other wise when the door closes, the strip will be crushed and eventually torn off. Most of the plastic or rubber foam will have self-sticking adhesive to hold it in place; otherwise it will be tacked on. Metal door frames will require the self-sticking type. The foam type is shown in Figure 39.

The beaded plastic or rubber strip, seen in Figure 40, is installed in much the same manner as is the foam type, except that on the hinge side it is mounted on the door.

Another common type of weather stripping is the copper or brass strip, shown in Figure 41. This metal strip is so shaped that the edge toward the outside of the door will hold a tension between the jamb and the door. The edge of the strip toward the door is nailed in place on the jamb.

Maintenance

In most cases the only maintenance recommended for weather stripping is to replace nails or tacks which are missing or to use rubber cement on the stick-on type. It is usually recommended that badly damaged stripping be removed and replaced.

Thresholds and Door Buttons

Exterior doors require a trim unit called threshold, shown in Figure 42. This seals the space between the bottom of the door and the door sill. Hardwood thresholds have been used for many years, and you will still see them being used. The modern trend for thresholds is toward metal, usually aluminum, with a plastic or rubber insert to create a tight fitting seal. Some thresholds do not have the seal attached to them, this type will require a sealing strip attached to the bottom of the door. See Figure 43 for this.

Exterior doors may be beveled at the bottom to insure a close fit between the door and threshold. This bevel will be in the direction to insure that the bottom of the door is lower on the inside than on the outside, as Figure 44 shows.

Always follow manufacturer's instructions when installing thresholds.

Door Closers

Door closers are used on outside doors and other doors which are subject to slamming due to drafts. Many models of door closers are available; so you may be expected to install, maintain, adjust, or repair any one of them. Needless to say, it would be impractical for us to try to cover each model specifically in this test, We can, however, provide general overview of the principles of operation and some of the adjustment, repairs, maintenance and installation procedures you will meet.

Door closers are available in either surface mount or mortise mount. They may operate hydraulically or pneumatically. However, the majority of the closers used for heavy doors operate hydraulically.

Pneumatic

Lightweight doors, such as storm doors and screen doors, normally use pneumatic closers. This type of closure is usually surface- mounted. The checking medium is air, and the airflow is adjustable by a set screw to control the speed of door closing. An internal spring closes the door.

Installation

Due to the many different types available, it is suggested that you follow the manufacturer's instructions when installing this equipment. Figure 45 shows a typical pneumatic closer.

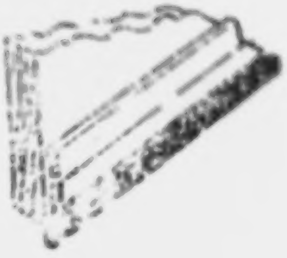


Figure 43. Seal Strip (door)

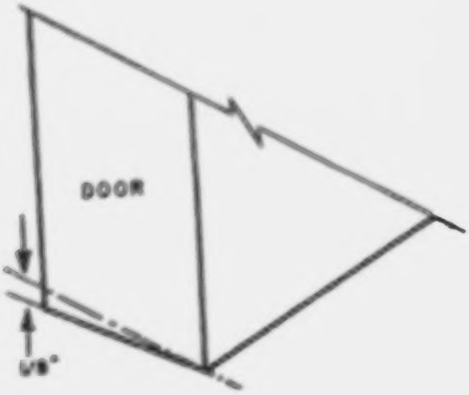


Figure 44. Door Beveling

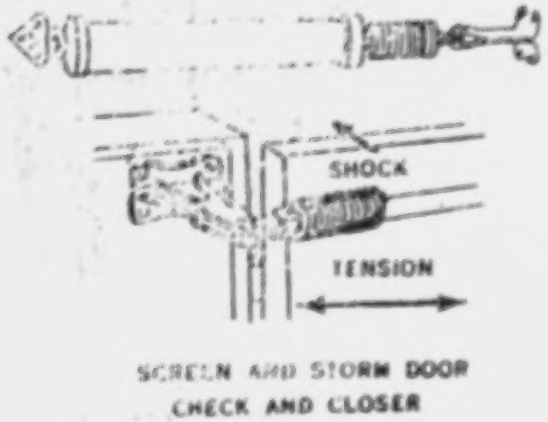


Figure 45. Pneumatic Door Closer

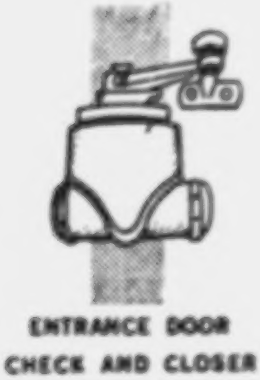


Figure 46. Hydraulic Door Closer

Hydraulic

Heavy doors, wood or metal, in public buildings require heavy duty closers. The hydraulic closer is available in many models. Of course, the model chosen will depend upon the application. Some models are suitable for either left or right-handed doors; however, they must be set up for the correct hand before installation. Other models come only for left or right-handed installation and must be ordered for the specific installation. With these types of closers the door is closed by a spring in the closer, and the speed is controlled by the hydraulic fluid. The hydraulic speed is controlled by the hydraulic fluid. The hydraulic flow is controlled by an adjustable restrictor. Both the spring tension and the hydraulic flow are adjustable, so that the closer can be adjusted to match the door.

Installation

As with the pneumatic closer, the hydraulic closer should also be installed according to the manufacturer's instructions, which will be packed with the unit. In areas of severe weather, especially high winds, it may be necessary for you to reinforce the door and jamb with metal plates to withstand the extra stress encountered. Figure 46 shows a typical hydraulic closer.

Maintenance and Repair

The simple pneumatic closers require only an occasional adjustment and lubrication. Remember, though, that the attaching screws should be checked for security.

The more complex hydraulic closers will require more attention than will the pneumatic types. Hydraulic closers have more points which require lubrication, and adjustments are more difficult. No adjustment should be attempted, however, without referring first to the manufacturer's instructions. Lubricant should be used sparingly to avoid staining doors, walls, and floors.

EXTERIOR DOORS-REPAIR AND MAINTENANCE

Materials and Maintenance Standard

Materials in general used for the construction of windows, screens, and doors and associated trim are made of wood or metal. For convenience, safety, and preservation of the structure, these components should be in operable condition at all times, weather-tight, and protected against deterioration.

Maintenance and Repair of Wood Doors

a. Large Doors. Mechanical injury to posts, headers, jambs, or hardware usually causes trouble with large wood-batten framed and braced doors (garage and warehouse type). Decay, resulting from exposure to weather or shrinkage of door members, also causes distortion or failure. Frequently the free edge of the door sags and causes it to bind at the bottom and open at the top.

(1) Check List. Effective remedies may be determined by first checking the following:

(a) Examine opening to see that hinge and lock sides are plumb and parallel.

(b) Check header to see that it is level.

(c) Check anchorage of posts.

(d) Check anchorage of hinges.

(e) Check lock face plates for projection beyond face of door.

(f) Check all members for swelling, shrinking or warping.

(2) Repairs. The following procedures apply when the door itself has shrunk or is warped, swollen or sagged.

(a) When a door shrinks, remove hinge leaves and install a filler (cardboard or metal shim) underneath. This forces the door closer to the jamb at the lock edge, and provided hinge pins do not bend, the door should then operate satisfactorily.

(b) Restore a warped door to its normal shape by removing and laying it flat. Weighting down may also be necessary. If it is still warped after a reasonable length of time, battens screwed to the door help restore it to true plane. Screw eyes, rods, and turnbuckles help straighten a door by gradually pulling it into place.

(c) Install a diagonal batten from top of hinge side to bottom of lock edge to repair a sagging door permanently. Temporary repair is made by installation of wire stay brace equipped with turnbuckles and placed diagonally.

(d) Doors or door members may require rebuilding because of neglect or abuse. Remove the door to a flat surface and replace damaged member. Carpenter's clamps assists in holding door members square while driving nails or screws.

(e) The door is trimmed when the preceding methods fail to correct the trouble. However, do not cut doors immediately following rain or damp weather. When dry, the door may fit too loosely.

b. Panel Doors. Failures in panel doors are similar to those in large wood doors. In addition they are subject to binding at the hinge edge, friction between dead bolt and strike plate, or between latch bolt and strike plate.

(1) Locking. Trouble with locking apparatus is generally caused by defective knobs or locks. Check the knob to determine whether it is loose on the spindle. Where a lock does not move smoothly, replacement may be necessary, althuugh repair of worn parts, or lubricating with graphite frequently overcomes the difficulty.

(2) Rattling. An excess of space between door and stop head causes the door to rattle. Removal and refitting of stop head while door is closed remedies this difficulty. The door may also rattle because of too much play between latch bolt and strike plate. Correct this condition by moving plate back toward the stop.

(3) Loose Hinges. Hinges become loosened if a door is too tight on the hinge edge and binds against the hinge jamb. If such a door has plenty of clearance on the lock side and the entire pin seems to move slightly when the door is closed, loosen both hinges at the frame and insert cardboard under

jamb leaves along the outer edges. To make a uniform space between the jam and the door, insert a strip of cardboard under the inner edge of the top hinge in the leaf which is fastened to the jamb. This usually corrects the trouble since it tends to pull the upper part of the door closer to the jamb. However, considerable space above the door and along the outside (lock edge) may result. In that case, loosen the screws in the leaf of the bottom hinge, which is attached to the jamb, and insert cardboard under the outer edge.

(4) Warping. A warped door which has sprung inward or outward at the hinge edge is impossible to close without considerable pressure against the bulging part. If planing is necessary because side margins are uneven and door strikes at top or bottom due to settlement of frame or similar causes, locate points of friction. It is easier and less noticeable to plane the hinge edge. Bevel lock edge of door about 3/16-inch to facilitate closing. When door face or casing is warped, or in other rare instances, this edge may require planing. Here it is best to make the cut before planing. Remove face plates and lock from the door; otherwise a true cut cannot be made. If the door still strikes along lock edge, plane hinge edge and cut in the hinge leaves flush with surface, if necessary.

(5) Sticking. Damp weather often causes a door to stick. Absorption of moisture results in swelling of framework and door and causes paint to soften and become sticky. If the door has an even margin along the top and bottom edges, and if the hinges are firm, it is necessary to plane the hinge edge. It is best to plane the hinge edge, since hinges are more easily removed and remortised than the lock. Take care not to plane off too much wood. Do not plane doors during damp weather, except where circumstances require immediate repairs. When it is necessary to trim a door for better fitting, carefully mark the amount to be planed, allowing clearance on all sides approximately the thickness of a dime. To determine correct amount of wood to be removed, set door hard against hinge side, wedge it plumb, and scribe desired thickness of material to be planed off. When planing or cutting is completed, repaint edges prior to rehanging the door.

(6) Bevel. Proper bevel for wood doors is about 1/16" per 1" of door thickness. Doors 1 3/8" or less do not required a bevel. (See Figure 47).

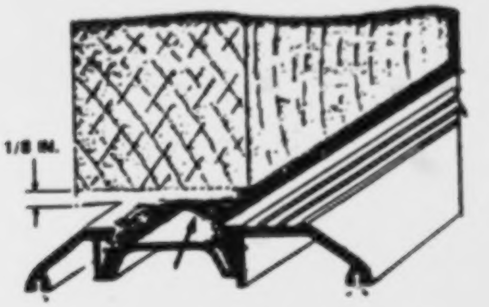


Figure 47. Bevel for Wood Doors.

Maintenance and Repair of Metal Doors

a. General. Doors in metal buildings generally are of materials which the type of building to which they afford entrance. In this instance, maintenance of the door material itself is similar to corresponding siding and roofing material. Where metal windows are used in masonry or wood frame construction, special treatment will be used in caring for the metal products involved. Purposes of fireproofing, insect control and storm protection may also dictate uses of metal doors on buildings and structures otherwise constructed of other materials. Among the types of metal doors in use in Air Force installations are metal-clad doors, hollow metal doors, solid metal doors and variations which include interchangeable glass and screen panels. These doors may be hinged, sliding or roll type depending on their size and application. Figures 48 and 49 illustrate typical types of metal doors.

b. Maintenance. Since the great majority of metal doors and fittings are shop designed and fabricated, it can be assumed that they will maintain their shape and mechanical operating ability provided hinges, locks, and other fittings remain secure in their fastenings. This is accomplished by checking screens, nuts and bolts, and special fasteners and operating devices regularly and keeping them tight and in good order. Building settlement, mechanical failure and collision may require investigation and corrective measures for a basic cause of misalignment in the structure framing itself. Frames must be plumb and corners square so the door may fit its opening with proper clearances. Weather proofing and caulking must be maintained in a workman-like manner. Mechanically damaged doors and frames must be removed and straightened, repaired or replaced. Repair material and furnishing should match the existing material. Shop repair of metal doors will meet acceptable standards for welding, riveting and sightliness. Replacement of surface metal on fire proof metal-clad wood doors must be weather tight and of the same gage material as originally provided.

Maintenance and Repair of Hangar and Warehouse Metal Doors:

(a) General. Larger doors of this type require specialized maintenance, in that most of them are rolling and motorized, and place extreme weight loads on the narrow bearing surface of supporting rails. Maintenance on the large metal areas is similar to maintenance procedures for metal siding, as discussed in this manual. Qualified engineering personnel will be consulted if major warping or displacement occurs to the sliding panels. Settling or failure of the roof trussing can cause displacement of overhead rails and guides, with subsequent stresses to the door panels themselves. Complicated devices for operating large doors will be maintained by following the manufacturer's instructions carefully. For maintenance on electric motors which operate hangar doors, refer to AFM 85-17.

(b) Minor Maintenance to Hangar and Warehouse Doors. It is important to the operation and general usefulness of large metal doors to regularly conduct minor maintenance of all working parts as well as the door itself.

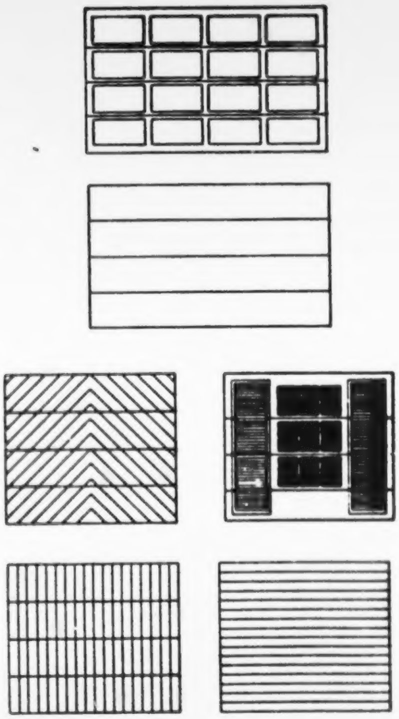


Figure 50. Overhead Metal Door.

1. Keep rails, guides, springs, and rollers secure and free from dust, dirt, corrosion and obstruction.

2. Keep upper rails and rollers lubricated according to manufacturer's instructions.

3. Check and maintain alinement of rollers and rails.

4. Check guides for security and alinement. Straighten bent guides.

5. Repair damaged glazed sections promptly according to paragraph below.

6. Inspect and lubricate motors as specified in AFM 85-17.

7. Keep hinges and springs free of dirt, debris and corrosion, and lubricate regularly. Replace spring or broken hinges and springs, and other door fittings.

8. Keep locks and latches lubricated and in good repair.

Maintenance and Repair of Screen Doors and Window Screens

Included in this category are screen doors, half-length, sliding window screens and fixed porch screens. Screens are provided and maintained in those buldings designated by the Installations Engineer. Current Air Force criteria in material and construction must apply.

a. Screen Cloth. Much of the screening found on Air Force buildings is made of comparatively short lived steel or iron wire, either painted or galvanized. Continued use of such painted or galvanized screen cloth is not recommended for other than planned short time use buildings. Do not use steel or iron wire screening in tropical zones. The use of corrosion and weather resistant material such as copper, bronze, aluminum or plastic, is recommended for most future screening needs. Large diameter (0.015 inch) metallic wire will give longer service in tropical areas where excessive condensation and salt air is encountered. Bronze wire (Type C, Fed. Spec. RR-C-451) is recommended for installation in barracks, dining facilities and similar buildings where rough usage may be expected. Commercial Bronze, better known as brass, (Type B, Fed Spec. RR-C-451) is not recommended for use in areas subject to excessive condensation and salt air. Shipments of screening delivered on requisitions for Type C, Bronze, should be tested to see that Type B, Brass, has not been substituted.

SUMMARY

As a carpenter, you are responsible for maintenance of Air Force Real Property. Doors and all of their supporting hareware receive a great deal of wear, it is your job to know how to repair or replace any item that may need it.

QUESTIONS

1. Unit 17, page 443, Textbook, Modern Carpentry, answer questions 1-10. Do not write in the textbook.

2. Answer each of the following questions:

   a. What type of hinge is mortised into the jamb with a router?

   b. What can be done to hinge a prolong its use?

   c. The most difficult lock to install is a _________ lock.

   d. A heavy duty, primary lock is a ___________ lock.

   e. What type of lubricant is used in exterior locks?

   f. What type of door closures are found on screen doors?

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-IV-4

INSULATION, GYPSUM BOARD AND CEILINGS

OBJECTIVES

a. Given incomplete statements, identify the procedures for installing, repairing, or replacing gypsum board, and celings.

b. Given procedures, insulation, tools, materials, equipment and working as a member of a team install insulation in an interior wall with no more than four instructor assists. Insulation must be securely fastened; joints must be overlapped with no voids.

c. Given procedures, gypsum board, tools, materials, equipment and working as a member of a team install gypsum board on an interior wall and ceiling with no more than three instructor assists. The gypsum board must be securely fastened and the joints must not exceed 1/8" in width.

d. Given procedures, acoustical tile, tools, materials, equipment and working as a member of a team install tile on a ceiling with no more than four instructor assists. Tile edges must fit tightly and be flush with all adjoining tile.

e. Given procedures, a room, materials, equipment and working as a member of a team install a suspended ceiling with no more than five instructor assists. The finished ceiling must be secured and within ± 1/8" of level.

INTRODUCTION

Any building that is designed to maintain a constant temperature during the summer and/or winter should be well insulated. Such insulation will insure maximum comfort and also an even temperature while keeping the heating and cooling cost to a minimum. The insulating of the average frame structure is almost always justified; the savings of fuel and electricity in just a short period will more than pay for the insulating cost.

INFORMATION

Heat is lost from a building in two ways: (1) by air leaking around doors and windows and (2) by conduction of heat through the materials in the walls, floors and ceilings, which then radiate heat to the outside air. These two losses should not be confused, though both can occur at the same time on the same door, window, wall or floor. The methods of insulating against them, however, are entirely different. The proper fitting of doors and windows will decrease air leakage around them. Regardless of the fit, both doors and windows should be fitted with proven weather stripping. Air leakage through walls may be serious in a poorly constructed building. It can be almost entirely eliminated in frame construction by properly applying good building paper beneath the outside wall covering. The second way of losing heat from a building is by transmission through solid (airtight) material. For example, when a glass of hot water is held in the hand, the heat of the water is transmitted through the glass and can be felt. The heat from a warm interior escapes to the cooler air outside by transmission through the wood of doors and walls, and through the plaster. Insulating materials must be poor conductors of heat so when placed in the walls they will form a thermal barrier. This barrier tends to keep the building more comfortable in both summer and winter by slowing the transmission of heat.

Insulation materials are divided into these four basic types:

- Flexible
- Rigid
- Loose fill
- Reflective

Of the types of insulation materials just listed, the flexible, rigid and loose fill types are made up of small cells (dead air spaces). These small, dead air spaces slow the transmission of heat; and the thicker the material is, the more effective it becomes in resisting the passage of heat.

Flexible Insulation

Flexible insulation is made in the form of "quilts" or "batts" which fit between standard spaced studs as shown in Figure 51. Quilts are normally used for insulating the walls, because the insulating material is entirely inclosed with a protective covering and the possibility of settling is eliminated. Most quilts have a continuous tab on each edge for fastening them to the frame members. Tacks may be used for fastening the quilts in place; but, an automatic stapling gun makes an easier and quicker job of it. Quilts are installed between the studs after the outside sheathing is in place. They are packaged in rolls and can be cut to the correct length with either a knife or a pair of tin snips. Quilts may be filled with any one of several different types of insulating materials, be careful to avoid splinters while handling it with bare hands. Wear protective equipment and clothing to eliminate hazards.

Insulating batts are similar to quilts, except they are packaged in flat batts 48 inches long and wide enough to fit between standard spaced frame members. One side is usually covered with a waterproof paper; whereas the other side has either plain kraft paper or no covering at all. Such batts are often used in the attic between the joists for insulating the ceiling. They can also be installed between floor joists for insulating over the crawl space in buildings without basements. In the attic, the need for fastening is eliminated, because the batts lie flat. The same type of material is used for making both batts and quilts. Special care should be taken during the installation of flexible insulation in order not to tear or puncture the outer line (vapor barrier) of the insulation. Unnecessary holes or tears in the insulating material will decrease its overall effectiveness.

Rigid Insulation

Rigid insulation boards are made in flat sheets from 1/2 to 1 inch thick. They may be made of cork, wood pulp, corn stalks, and various other vegetable fibers. Cork is not generally used for insulation in construction work, except in special temperature-control rooms, such as walk-in refrigerators. Most present-day rigid fiberboards not only provide insulation but also serve as a structural sheathing in place of wood. The rigid boards most commonly used for sheathing are treated with asphalt to make them waterproof. This treatment may be either a complete saturation or a thin exterior coating. When untreated rigid boards are used for sheathing, waterproof building paper should be used just as for wood sheathing. Rigid boards may have square edges, shiplapped edges, tongue-and-groove edges, or a combination of these. When fiberboard sheathing is to be covered with shingles, furring strips are recommended, since the fiberboard does not provide solid anchorage for ordinary nails. Furring strips or horizontal siding must be nailed through the sheathing into the studs.

Loosefill Insulation

Loose fill insulation is the same material as that used in quilts or batts. It is packaged in large bags and may be used for insulating both the ceiling and side walls of a building. When you are using it in the attic, it is a simple matter to fill the space between the joists. For the outside walls, however, you must blow or have blown the loose insulation through an opening made near the top of the wall between each stud. After a building has been completed, it is almost impossible to install quilt or batt type insulation without excessive labor, and damage to the walls; but loose fill type insulation can be installed in finished walls with little difficulty.

Refective Insulation

Reflective insulation turns back radiant heat similar to the way in which a mirror reflects light. Since very little of the heat penetrates the reflecting surface, this type of insulation is very thin, usually aluminum foil, cemented to one or both sides of a craft paper. It can be used separately or in conjunction with the other three types we have just discussed. When used separately it is looped between the studs, tacked or stapled on the edge of each stud, and creased, as shown in Figure 52. This method creates an additional air space, which also adds to the insulating effect. Ordinarily the shiny side of the foil should face toward the inside on walls and toward the outside when placed between the rafters in the roof.

Thin foil may also be cemented to one or both sides of rigid fiberboards or it may be used as part of the protective covering on quilts or batts.

Vapor Barriers

A vapor barrier, as defined in Webster's Dictionary, is a layer of material used to retard or prevent the absorption of moisture into a construction such as a wall or floor.

The vapor barrier is, in more cases, installed facing the occupied (living) area of a building as illustrated in Figure 53. This is to prevent the warm humid air from penetrating the wall surface and forming moisture within the wall area. The detailed drawings in Figure 53 shows how a vapor barrier controls moisture.

Most flexible insulating materials produced today have a vapor barrier applied to the inside surface of the quilt or batts; when installed properly they will prevent condensation from forming in the wall. When the blankets are ill fitted or the vapor barrier becomes damaged, moisture can penetrate the wall and cause deterioration (rot or insect infestation) of the wall section.

If the insulating materials do not have a satisfactory vapor barrier, a plastic film vapor barrier can be added, as shown in Figure 54. Other suitable vapor barriers are: aluminum foil, asphalt-coated paper or other types of material which will prevent the penetration of moisture. You should install this type of vapor barrier just prior to installing the interior wallboard to prevent accidental tears and punctures of the barrier.

Gypsum Board

Gypsum board wall covering is made in a way similar to the way rock lath is made, except that it has no holes and the paper covering is thicker and stronger. The sheets are very brittle and require extremely careful handling to prevent breaking. Approximately 1-1/4 inches of each edge is made 1/16 inch thinner than the body of the sheet. When two sheets are placed side by side, the thin edges form a recess to receive perforated paper tape and gypsum cement which conceals the joints between the sheets.

Installing Gypsum Board

On new construction, it is your job to nail, or otherwise secure, the gypsum board to the ceiling and wall areas. When you are covering both walls and ceilings, start with the ceiling first and determine the best arrangement of the sheets on the ceiling joists. Begin at a corner and raise the sheet of gypsum board into position. Nail this first piece in place so that the long dimension of the sheet runs perpendicular to the ceiling joists. If the room is small, span the entire width of the room with one piece. If this is not possible, stagger the end joints in the following rows.

To apply a single thickness of gypsum board to a wall, start in a corner and work around the room making sure that each joint breaks at the centerline of a stud. Use 1/2-inch thick gypsum board and span the entire height of the wall, if possible.

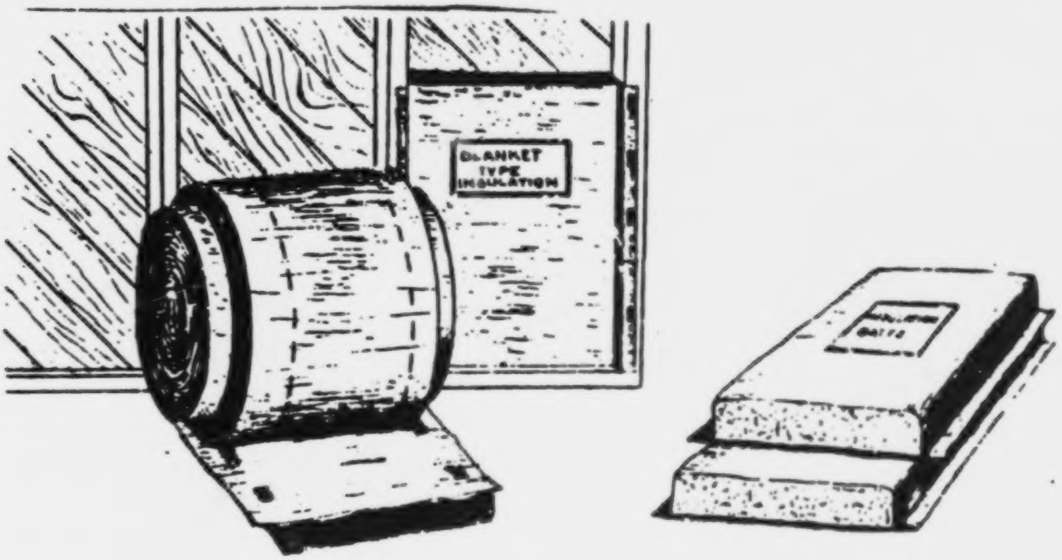

BLANKET TYPE INSULATION
BATTS

Figure 51. Flexible Insulation

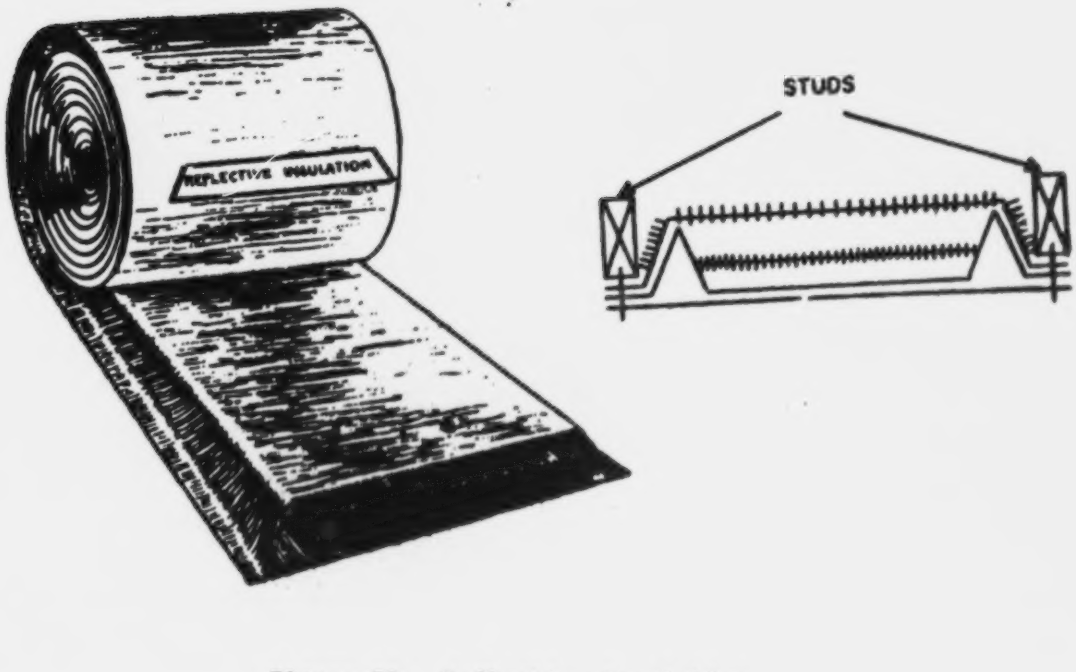
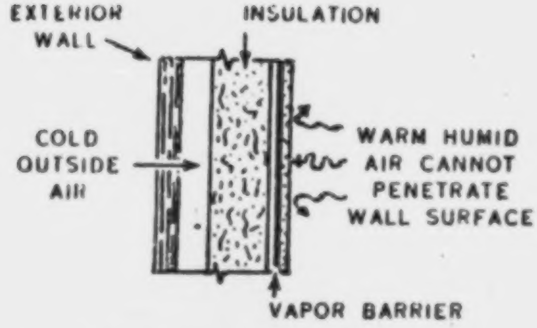
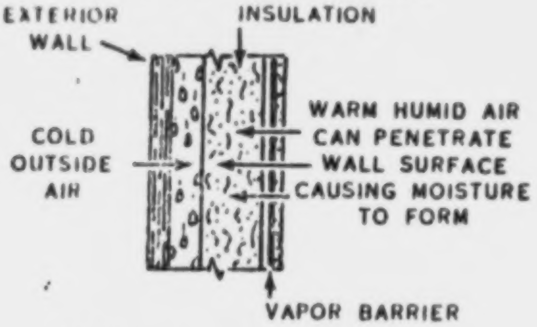

REFLECTIVE INSULATION
STUDS

Figure 52. Reflective Insulation


EXTERIOR WALL
INSULATION
COLD OUTSIDE AIR
WARM HUMID AIR CANNOT PENETRATE WALL SURFACE
VAPOR BARRIER

WALL WITH VAPOR BARRIER


EXTERIOR WALL
INSULATION
COLD OUTSIDE AIR
WARM HUMID AIR CAN PENETRATE WALL SURFACE CAUSING MOISTURE TO FORM
VAPOR BARRIER

WALL WITHOUT VAPOR BARRIER

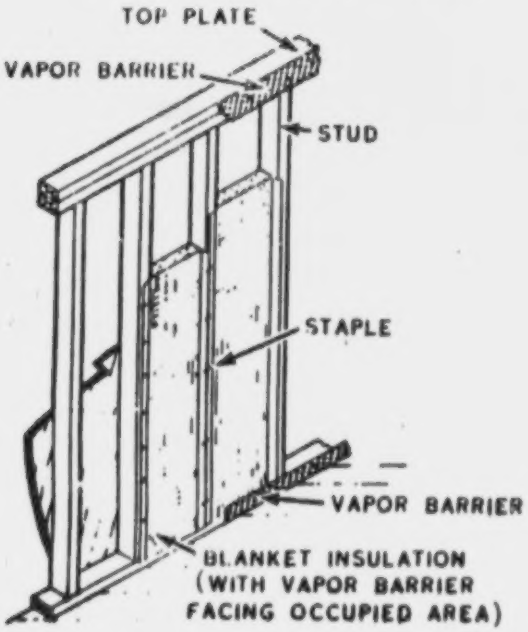

TOP PLATE
VAPOR BARRIER
STUD
STAPLE
VAPOR BARRIER
BLANKET INSULATION (WITH VAPOR BARRIER FACING OCCUPIED AREA)

Figure 53. Flexible Insulation With a Vapor Barrier

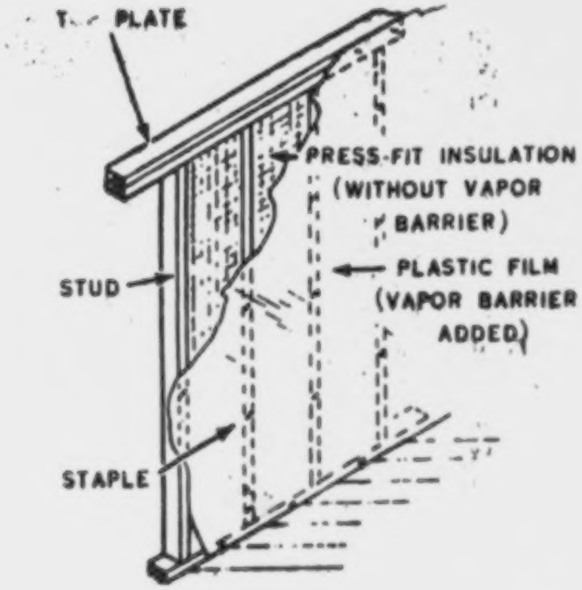
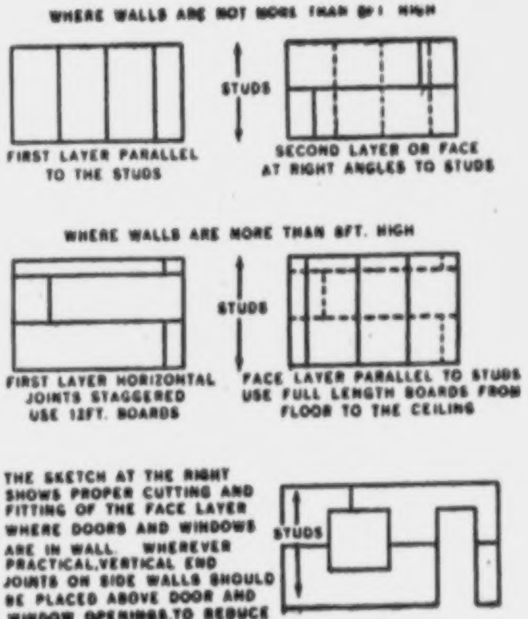

TOP PLATE
PRESS-FIT INSULATION (WITHOUT VAPOR BARRIER)
STUD
PLASTIC FILM (VAPOR BARRIER ADDED)
STAPLE

Figure 54. Installing Plastic Film Vapor Barrier


WHERE WALLS ARE NOT MORE THAN 8FT HIGH
STUDS
FIRST LAYER PARALLEL TO THE STUDS
SECOND LAYER OR FACE AT RIGHT ANGLES TO STUDS
WHERE WALLS ARE MORE THAN 8FT. HIGH
STUDS
FIRST LAYER HORIZONTAL JOINTS STAGGERED USE 12FT. BOARDS
FACE LAYER PARALLEL TO STUDS USE FULL LENGTH BOARDS FROM FLOOR TO THE CEILING
STUDS

THE SKETCH AT THE RIGHT SHOWS PROPER CUTTING AND FITTING OF THE FACE LAYER WHERE DOORS AND WINDOWS ARE IN WALL. WHEREVER PRACTICAL, VERTICAL END JOINTS ON SIDE WALLS SHOULD BE PLACED ABOVE DOOR AND WINDOW OPENINGS TO REDUCE THE JOINT TREATMENT TO A MINIMUM

Figure 55. Placing Wallboard

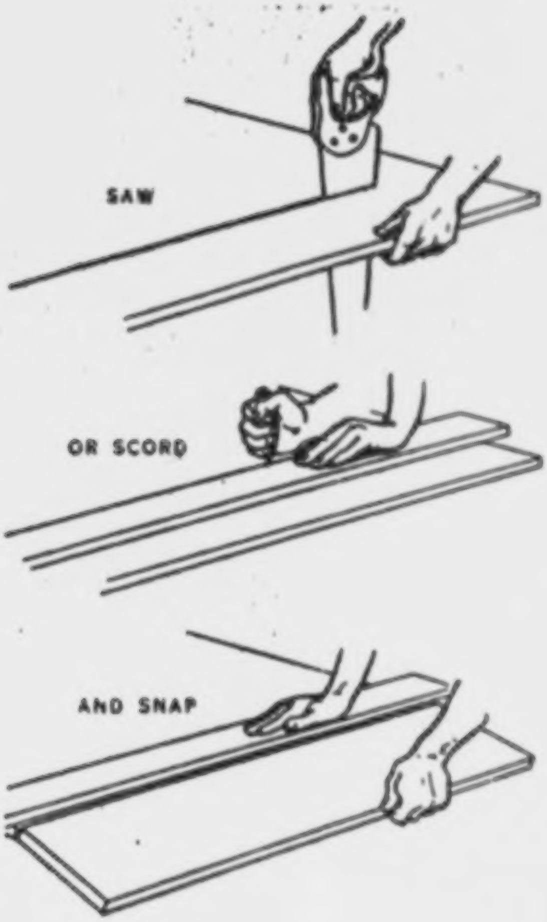


Figure 56. Cutting Gypsum Board

If the building plans call for two layers of wallboard, each layer should be 3/8 inch thick. Nail the base layer vertically to the studs. The face layer should be applied horizontally over the base layer with an adhesive, which makes the two adhere. The proper methods of placing single and double-thickness gypsum board to wall surfaces are illustrated in Figure 55.

Full sheets can easily be cut on the job for fitting to the studs. You can cut the panels by sawing or by scoring with a knife and snapping over a straight-edge. Cutting methods are shown in Figure 56. Always cut the panel with the finish side up in order to avoid damaging the finish surface. You can mark the openings for pipe and electrical receptacles and cut them with a keyhole saw.

When installing gypsum board to walls and ceilings maintain a 1/8-inch space between the joints of the sheet to help hold the filler cement in place. The sheets are usually fastened in place with blued nails which have an oversized head and are 1 1/2 inch long. However, rustproof nails specially designed with annular rings for better holding characteristics may be used instead. The heads of these nails are slightly smaller than blued nails, and they are approximately 1 1/4 inches in length.

The spacing of nails will vary with the different thicknesses and locations of the gypsum board. In general, nails are spaced 6 to 8 inches apart on walls and 5 to 7 inches apart on ceilings. Space nails not less than 3/8 inch from the outside edges. These nails are driven slightly below the surface of the wallboard and covered with perforated tape and cement.

Nails in the middle of the sheets are spaced about the same distance apart as are those along the edges and should be set below the surface to receive the filler cement. It is common practice to strike the nailheads one extra blow for setting. This makes a slight depression (hammer mark) which holds the cement around the head. Be careful, however, when setting nails, not to break the outer paper surface because such breaks in the paper will drastically reduce the nail's holding power.

SUMMARY

Comfort, energy efficiency and appearance are all part of your job. You must be knowledgeable of insulation, gypsum board and acoustical ceiling installation in order to perform that job.

QUESTIONS

Answer the following questions from the textbook, Modern Carpentry.

1. Answer questions 1, 2, 3, 6, 7, 8, 9, 10 and 13, page 356.

2. Answer questions 1-17, page 387.

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WORKBOOK

J3ABR55230 000-IV-1 thru 4

TECHNICAL TRAINING

Carpentry Specialist

FINISH CONSTRUCTION

May 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use
DO NOT USE ON THE JOB

ATC FORM 214 (JAN 76) OBSOLETES ATC FORMS 214, MAY 69, 522, NOV 63 AND 523, MAY 71. STANDARD COVERSHEET

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This workbook contains the measurement devices designed to ensure that you have mastered the required tasks and knowledges as reflected in the current training standard.

The workbook will be controlled by the instructor at all times and will be used to evaluate your attainment of objectives. Upon completion of each workbook exercise, your response or actions will be graded and annotated as satisfactory (S) or unsatisfactory (U) on the criterion checklist. You must attain a satisfactory grade on all objectives in each instructional unit for the entire block, prior to being administered the end-of-block written test.

This workbook will remain the property of the course and will be destroyed upon satisfactory completion and annotation of objectives in the criterion checklist.

UNDER NO CIRCUMSTANCES will you be allowed to remove this workbook from the classroom and/or training area as applicable unless under the direct supervision of your instructor.

Supersedes WB J3ABR55230-II-1 thru II-6-P1, June 1983
(Copies of superseded publications may not be used.)

STAIRS

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-1a

PROJECT OR TASK: Construct and Install a Stairway

OBJECTIVE:

Given tools, equipment, materials and working as a member of a team construct and install steps with no more than five instructor assists. The steps must be plumb and level.

INSTRUCTIONS:

1. This is Progress Check IV-1a.
2. Your instructor will assign you to a team for the completion of this Progress Check.
3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Five instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials needed for completing this progress check.
6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.
7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Working as a member of a team demonstrate proficiency by completing the following exercise:

1. Determine layout requirements.
2. Layout by stepping off proper number of units.

3. Layout drop of stringer.

4. Assemble stairs.

5. Install stairs.

6. Ensure steps (stairs) are plumb and level.

WINDOWS, SCREENS AND GLASS

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-2a

PROJECT OR TASK: Identify Windows, Screens and Glass

OBJECTIVE:

Given incomplete statements, identify the procedures for installing or replacing window units, screens, and glass by completing the statements.

INSTRUCTIONS:

1. This is Progress Check IV-2a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return them to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Complete the following statements

1. Windows that are hinged on the side are known as ______________________.

2. Windows that are hinged at the top are ______________________________.

3. Windows that consists of two sashes that slide up and down in the window frame are called ______________________________.

4. A window that is hinged on the bottom and swings inward is called a/an

_________________________________.

5. When replacing screen in a metal frame it is secured by _______________ in a channel.

6. Laminated glass has transparent _________________ between two sheets of glass.

7. Tempered glass is heated and then _________________ quickly.

8. Obscure glass does not provide clear _________________________________.

9. Common safety equipment for glass cutting includes gloves and _________.

10. To secure glass in a wooden frame glazing ____________________ are used.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-2b

PROJECT OR TASK: Install Window Frame and Sash

OBJECTIVE:

Given procedures, window frame, sash, tools, materials and working as a member of a team install the window frame and sash in an exterior wall with no more than five instructor assists. The window must operate without binding and be within ± 1/8" of plumb.

INSTRUCTIONS:

1. This is Progress Check IV-2b.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Five instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Check rough opening for correct size.

2. Place window unit in rough opening.
3. Temporarily secure frame by placing a nail on each side in the casing close to the sill.
4. Raise and level frame rising wedges.
5. Secure bottom of frame.
6. Plumb side jamb.
7. Secure top of frame by placing a nail in the casing close to top.
8. Check frame for square to ensure within ± 1/8" of plumb.
9. Check window to ensure operation without binding.
10. Permanently nail frame in place.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-2c

PROJECT OR TASK: Install Screen Materials

OBJECTIVE:

Given procedures, screen materials, tools, equipment and working as a member of a team install screen materials in a frame with no more than five instructor assists. The installed screen must be tight and free of wrinkles.

INSTRUCTIONS:

1. This is Progress Check IV-2c.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Five instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Measure length and width of frame.

2. Cut screen 2 to 3 inches oversize.
3. Secure screen at one end of frame.
4. Stretch screen tight and secure opposite end.
5. Secure adjacent sides.
6. If using wood frame, use staples or tack and then secure molding.
7. If using a metal frame use a vinyl bead or metal spline and screen wire roller.
8. Ensure screen is tight and free of wrinkles.
9. Remove excess screen using a utility knife.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-2d

PROJECT OR TASK: Replace Glass

OBJECTIVE:

Given window glass, tools, materials, equipment and working as a member of a team replace the glass in a window frame with no more than five instructor assists. The installed window glass must fit tightly and be water tight.

INSTRUCTIONS:

1. This is Progress Check IV-2d.

2. This progress check will be completed concurrently with Progress Check IV-2e.

3. Your instructor will assign you to a team for the completion of this Progress Checks.

4. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

5. Five instructor assists per group will be available for this progress check.

6. Your instructor will provide you with all tools and materials needed for completing this progress check.

7. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

8. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

9. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

10. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using glass and tools provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Prepare sash
2. Cut glass correct size
3. Apply bed putty
4. Install glass
5. Install glazing points
6. Apply face putty
7. Ensure window glass is tightly fitted.
8. Ensure window glass is water tight.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-2e

PROJECT OR TASK: Glass Safety

OBJECTIVE:

Given procedures, safety equipment, glass, tools and working as a member of a team exercise safety precautions while handling glass.

INSTRUCTIONS:

1. This is Progress Check IV-2e.

2. This progress check will be completed concurrently with Progress Check IV-2d.

3. Your instructor will assign you to a team for the completion of this Progress Check.

4. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

5. No instructor assists will be available for this progress check.

6. Your instructor will provide you with all tools and materials needed for completing this progress check.

7. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

8. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

9. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

10. You are to return the completed progress checks to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Wear eye protection and gloves while handling glass.

2. Use care when procuring glass.

   a. Large pieces of glass should be marked while being moved.

   b. Take precautions not to cut yourself or anyone else.

3. While working with glass use care not to cut yourself or anyone else.

   a. Keep hands off glass table.

   b. Do not sit or lean on glass table.

4. Store unused glass in glass storage area.

5. Dispose of waste glass in specially marked container.

6. Exercise safety precautions while handling and storing glass products.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-2f

PROJECT OR TASK: Realign Window Frame

OBJECTIVE:

Given procedures, a window, tools, equipment and working as a member of a team realign the window frame with no more than three instructor assists. The window must operate freely without binding.

INSTRUCTIONS:

1. This is Progress Check IV-2f.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Three instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I

(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Place window in rough opening.
2. Level from bottom using wedges.
3. Plumb sides.
4. Temporarily nail in place
5. Check for smooth operation.
6. Ensure the window operates freely without binding.
7. Nail securely in place.

DOORS AND DOOR HARDWARE

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-3a

PROJECT OR TASK: Identify Doors and Door Hardware

OBJECTIVE:

Given incomplete statements, identify the procedures for installing, replacing, or repairing, doors, door trim and, door hardware.

INSTRUCTIONS:

1. This is Progress Check IV-3a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress checks using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return it to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Complete the following statements:

1. Exterior doors in residential construction are nearly always ____________ high.
2. Main entrances usually are equipped with a single door that is __________ wide.
3. FHA Minimum Property Standards specify a minimum exterior door width of __________________________.
4. Panel doors consist of stiles, rails and _______________________________.

5. In residential construction, outside doors swing ____________________.

6. The lower hinge on a door should be ____________________________ from the bottom.

7. The upper hinge should be ______________________ from the top.

8. Two types of door locks are cylinder and ____________________________.

9. The door knob is to be located ______________________________ from the finished floor.

10. Outside wood casing for doors is attached with nails spaced ____________ in O.C.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-3b

PROJECT OR TASK: Fabricate Exterior Door Frame

OBJECTIVE:

Given procedures, materials, equipment, a rough opening for an exterior door and working as a member of a team fabricate and install an exterior door frame and exterior door with no more than five instructor assists. The door frame must be within ± 1/16" of plumb and level and the door must operate without binding.

INSTRUCTIONS:

1. This is Progress Check IV-3b.
2. Your instructor will assign you to a team for the completion of this Progress Check.
3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Five instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials needed for completing this progress check.
6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.
7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Measure and cut material for door jamb.

2. Install hinges at the correct position.

3. Assemble and install the jamb in opening.

4. Level sill.

5. Level head jamb.

6. Plumb side jambs.

7. Secure frame properly.

8. Make necessary corrections.

9. Install hardware.

10. Ensure door frame is within ± 1/16" plumb and level.

11. Ensure door operates without binding.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-3c

PROJECT OR TASK: Install Interior Door and Frame

OBJECTIVE:

Given procedures, materials, equipment, a rough opening for an interior door and working as a member of a team install the interior door frame and door with no more than five instructor assists. The door frame must be within ± 1/16" of plumb and level and the door must operate without binding.

INSTRUCTIONS:

1. This is Progress Check IV-3c.
2. Your instructor will assign you to a team for the completion of this Progress Check.
3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Five instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials needed for completing this progress check.
6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.
7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Measure and cut material for door jamb.

2. Install hinges at the correct position.

3. Assemble and install the jamb in opening.

4. Level head jamb.

5. Plumb side jamb.

6. Secure frame properly.

7. Make necessary corrections.

8. Install hardware.
9. Ensure door frame is within ± 1/16" of plumb and level.
10. Ensure door operates with out binding.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-3d

PROJECT OR TASK: Install Door Trim

OBJECTIVE:

Given procedures, an exterior door, a framed opening, tools, materials, equipment and working as a member of a team install door trim with no more than five instructor assists. Door trim must fit smoothly.

INSTRUCTIONS:

1. This is Progress Check IV-3d.
2. Your instructor will assign you to a team for the completion of this Progress Check.
3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Five instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials needed for completing this progress check.
6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.
7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Measure and cut material for door trim.

2. Miter corners of trim.

3. Level head trim.

4. Plumb side trim.

5. Ensure door trim fits smoothly.

6. Secure by nailing at 16 O.C.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-3e

PROJECT OR TASK: Install Weather Stripping

OBJECTIVE:

Given specifications, an installed exterior door, materials, tools, equipment and working as a member of a team install weather stripping with no more than five instructor assists. Weather stripping must allow door to close and seal out air around door edges.

INSTRUCTIONS:

1. This is Progress Check IV-3e.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Five instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using specifications provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Select tools and materials needed.
2. Install according to manufacturer's specifications.
3. Ensure door closes and seals out air around door edges.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-3f

PROJECT OR TASK: Repair Door

OBJECTIVE:

Given a damaged exterior door, materials, tools, equipment and working as a member of a team repair the door with no more than five instructor assists. The door must present a smooth and neat appearance, fit into the door frame and operate without binding.

INSTRUCTIONS:

1. This is Progress Check IV-3f.
2. Your instructor will assign you to a team for the completion of this Progress Check.
3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Five instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials needed for completing this progress check.
6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.
7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Determine extent of damage to door.

2. Replace or repair damaged parts.

3. Check for smooth and neat appearance.

4. Check door for operation to ensure operation without binding.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV 3g

PROJECT OR TASK: Install Door Locks and Closers

OBJECTIVE:

Given specifications, an exterior door hanging in an opening, materials, tools, equipment and working as a member of a team install door locks and closers with no more than two instructor assists. Locks must allow door to close and latch tightly. Closers must enable door to close smoothly without slamming.

INSTRUCTIONS:

1. This is Progress Check IV-3g.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Two instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using specifications provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Read manufacturer's specifications prior to the installation of door locks and closers.

2. Lay out all work to be done prior to installation IAW MS.

3. Install door locks and closers IAW MS.

4. Make necessary adjustments to door locks and closers to insure proper operation to include:

    a. Locks allow door to close and latch tightly.

    b. Closers enable door to close smoothly without slamming.

INSULATION, GYPSUM BOARD AND CEILINGS

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-4a

PROJECT OR TASK: Indentify Insulation, Gypsum Board and Ceilings

OBJECTIVE:

Given incomplete statements, identify the procedures for installing, repairing, or replacing insulation, gypsum board, and ceilings.

INSTRUCTIONS:

1. This is Progress Check IV-4a.
2. You are to work individually while completing this progress check.
3. You are to complete this progress check from memory, using no notes or other reference materials.
4. You must provide correct responses to all items on this progress check.
5. Return the completed progress check to your instructor.
6. Your instructor will grade the progress checks using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
7. Your instructor will return the graded progress check to you for review.
8. After reviewing the progress check, return them to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Complete the following statements pertaining to insulation, gypsum board, and ceilings.

1. Older structures may be insulated without removing interior wall surfaces

   by using ______________________________ insulation.

2. The insulation that can be made from various materials, and is used for roof and wall sheathing, subflooring, interior surface of walls and ceil-

   ings, and under foundation walls or slabs is ______________________ insulation.

3. The insulation which requires an air space and its insulation valve is determined by its number of reflective surfaces is ________________.

4. The membrane through which water vapor cannot easily pass is the ____________________________.

5. The nail spacing for installing gypsum board on ceilings is ____________ on center.

6. The dimple is put in gypsum board for _______________________ purposes.

7. The wall or ceiling material used to absorb sound is called ___________.

8. When installing acoustical wall tile, if the border tile is too narrow, move the center line ____________________ the width of the tile.

9. When installing nonflanged ceiling tile, the first tile is place in the _________________________ of the ceiling.

10. Flanged ceiling tile is secured by using ______________________________ staples per flange.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-4b

PROJECT OR TASK: Install Insulation

OBJECTIVE:

Given procedures, insulation, tools, materials, equipment and working as a member of a team install insulation in an interior wall with no more than four instructor assists. Insulation must be securely fastened; joints must be overlapped with no voids.

INSTRUCTIONS:

1. This is Progress Check IV-4b.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Four instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Cut insulation 2" to 3" oversize.

2. Install from top plate downward to sole plate.

3. Overlap joints with no voids.

4. Staple to studs every 12".

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-4c

PROJECT OR TASK: Install Gypsum Board

OBJECTIVE:

Given procedures, gypsum board, tools, materials, equipment and working as a member of a team install gypsum board on an interior wall and ceiling with no more than three instructor assists. The gypsum board must be securely fastened and the joints must not exceed 1/8" in width.

INSTRUCTIONS:

1. This is Progress Check IV-4c.
2. Your instructor will assign you to a team for the completion of this Progress Check.
3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Three instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials needed for completing this progress check.
6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.
7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Layout and cutting of gypsum board:

   a. Measure opening to be covered.

   b. Layout on face of gypsum board.

   c. Cut through face using utility knife.

   d. Snap and cut back paper.

   e. Use coping saw, compass saw, or electric saber saw to make cuts for irregular shapes and curves (such as for light fixtures, electrical outlets.)

2. Securing gypsum board

   a. On ceilings, spacing is every 5" - 7" for nails or every 12" on center for screws; and on walls every 6" - 8".

   b. Ceiling must be hung at right angles to the framing members.

   c. Sidewalls can be hung vertical or horizontal.

   d. Space nails at least 3/8" from outer edges.

   e. Drive nail into gypsum enough to leave a dimple in the gypsum around the head of the nail. Do not tear paper or crack gypsum.

   f. Nails must be long enough to penetrate at least 2/4" into framing members (such as 1 1/4" annular ring nails).

3. Install ceilings before installing walls.

4. Break joints on framing members.

5. Leave 1/8" space between joints for joint compound.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-4d

PROJECT OR TASK: Install Acoustical Tile

OBJECTIVE:

Given procedures, acoustical tile, tools, materials, equipment and working as a member of a team install tile on a ceiling with no more than four instructor assists. Tile edges must fit tightly and be flush with all adjoining tile.

INSTRUCTIONS:

1. This is Progress Check IV-4d.
2. Your instructor will assign you to a team for the completion of this Progress Check.
3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.
4. Four instructor assists per group will be available for this progress check.
5. Your instructor will provide you with all tools and materials needed for completing this progress check.
6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.
7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.
8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.
9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Measure ceiling.
2. Locate and chalkline centers of ceiling from endwall to endwall and from sidewall to sidewall.
3. Determine border tile size and chalkline for border tile.
4. Establish new centerline if required because of border tile size.
5. Apply walnut-sized daubs of adhesive 1 1/2" in from all four corners of one tile.
6. Place first tile in center of ceiling.
7. Put adhesive on each tile as you are ready to install it and install tiles in a row from the first tile.
8. Keep installing tiles one row at a time, working from the center of the room.
9. Ensure tile edges fit tighty and are flush wire are adjourning tile.

COURSE: J3ABR55230 000

PROGRESS CHECK: IV-4e

PROJECT OR TASK: Install Suspended Ceiling

OBJECTIVE:

Given procedures, a room, materials, equipment and working as a member of a team install a suspended ceiling with no more than five instructor assists. The finished ceiling must be secured and within ± 1/8" of level.

INSTRUCTIONS:

1. This is Progress Check IV-4e.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with this objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Five instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Determine ceiling height.
2. Attach wall molding.
3. Plan layout in the same manner as for other ceiling tile.
4. Determine main runner and cross tee layout.
5. Install screw eyes and wire.
6. Attach main runners to wire.
7. Use a chalkline or builders string to level main runners with wall molding.
8. Attach cross tees.
9. Install tile panels.
10. Ensure finished ceiling is secure.
11. Ensure finished ceiling is within ± 1/8" of level.

STUDY GUIDE
J3ABR55230 000-V-1 thru 3

TECHNICAL TRAINING

Carpentry Specialist

PREFAB BULIDINGS AND BUILDING REPAIR

June 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use

DO NOT USE ON THE JOB

Purpose of Study Guide

This study guide (SG) is designed to guide you through your study assignment in the most logical sequence for easy understanding and to provide you with practical exercises or work in conjunction with each study assignment. Complete each exercise or work assignment in the sequence given and it will aid you in understanding and retaining the key points in each assignment.

Directed Study will be assigned, by the classroom instructor, before the close of each training day and the assignment will be checked the following training day prior to the days lesson. Questions will be addressed at that time. Directed Study measurement will be included in the applicable Criterion Objective's Progress Check.

Study Guide J3ABR55230 000-V-1 thru 3

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3	Flooring, Caulking and Prefab Units	3-1

Supersedes SG J3ABR55230 000-V, December 1985
(Copies of superseded publications may not be used.)

3770 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-V-1

PANELING AND TRIM

OBJECTIVES

a. Given incomplete statements identify the procedures for installing paneling by completing the statements.

b. Given procedures, paneling, tools, materials, equipment and working as a menber of a team panel an existing wall with no more than two instructor assists. Paneling must be securly fastened to the wall, plumb, and all joints must be butted.

c. Given tools, materials, equipment and working as a member of a team cut and install trim with no more than two instructor assists. The joints must be tight and smooth.

INTRODUCTION

Paneling and trim provide a fast and easy way to decorate a wall. Paneling and trim will give a wall a very beautiful and finished appearance, when installed correctly. This unit covers the types of paneling and trim and the correct installation procedures.

INFORMATION

TYPES OF PANELING

Wood Paneling

Interior walls and ceilings which are to receive transparent finishes must be constructed from top-quality materials. Number 1 grade, clear fir plywood and mahogany-veneered plywood make attractive walls for offices in warehouse and shop areas. These materials are reasonably priced and easy to obtain. Cherry, Walnut, or birch-veneered plywood and plank paneling are used in high-priority executive offices. These materials usually come with a factory-applied finish.

Plank Paneling

Plank paneling comes in various widths and thicknesses, depending upon its intended application. The individual planks have either tongue-and-groove or shiplap edges. You almost always install plank paneling vertically on the wall framework. To properly install and nail the planks in a vertical position, you must install grids, or horizontal blocks, between the wall studs. For an 8-foot-high wall, three rows of grids are generally used. Space them at 2-, 4-, and 6-foot levels above the floor. You can then place the planks in a vertical position and nail them at the sole plate, the top plate, and at each of the grids.

Plywood Panels and Veneers

Plywood panels are used extensively as interior wall covering. These panels can be obtained in sizes from 1/4 to 3/4 inch thick; 36 to 48 inches wide; and 60, 72, 84 and 96 inches long. Douglas fir is most often used for making these large panels of plywood. Some face panels are available in various cabinet woods such as oak, birch, mahogany, and other hardwoods. Plywood gives a wall a wood-finish surface.

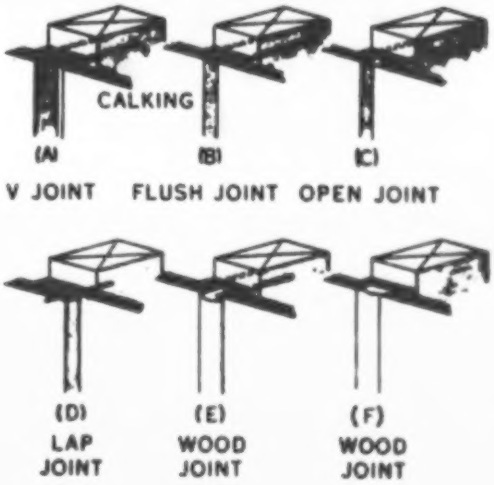
CALKING
(A)
V JOINT
(B)
FLUSH JOINT
(C)
OPEN JOINT
(D)
LAP
JOINT
(E)
WOOD
JOINT
(F)
WOOD
JOINT

Figure 1. Plywood Panel Joists

PANELING INSTALLATION

Plywood panels that are 3/8 inch, or thicker, can be nailed directly to the wood studs in the wall. You usually will apply these panels from floor to ceiling and fasten them with 4d finishing nails. Figure 1 shows how special strips or battens of either wood or metal are used to conceal the joints. Figure 2 ilustrates how a typical inside and outside plywood corner is finished.

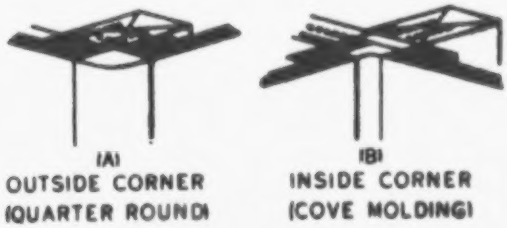
(A)
OUTSIDE CORNER
(QUARTER ROUND)
(B)
INSIDE CORNER
(COVE MOLDING)

Figure 2. Finished Corners for Plywood Panels

Plywood and veneers of less than 3/8-inch thickness must be applied over a solid backing. You will find that these panels usually come with a factory finish and often have "V" grooves machined into the face surface to give them the appearance of wood planking. First, nail either 1/4-inch or 3/8-inch gypsum board to the wall studs as a backing. Then secure the veneer panels with cement and L/d nails at the top plate and at the sole plate. Use only enough nails to hold the panels in position until the cement dries.

When lower sections of gypsum board walls are continuously damaged by rough usage, it may be necessary for you to replace the panels. Where rough usage is the main factor, you may correct the condition by installing a wainscot, as shown in Figure 3.

A wainscot is used to protect the lower section of the wall. You may construct it of wood, plywood, or tempered (hard) fiberboard. Cover the top edge, located 3 or 4 feet above the floor, with a molding. This top molding is commonly referred to as a chair rail.

Good workmanship is vital in the installation of any of the interior wall surfaces that we have discussed. The wood in wall covering is usually selected because of its desirable color, the number and kinds of knots, and the grain. The edges are molded and the surface sanded to produce an attractive finish.

To prepare new surfaces for transparent finishes, sand the woodwork to remove all marks and blemishes. Be very careful when you sand a veneer surface on plywood, do not sand through the veneer covering. Use either a sanding block or a small vibrating sander for this operation. Never use a belt or rotary power sander; finally, do all sanding in the direction of the grain.

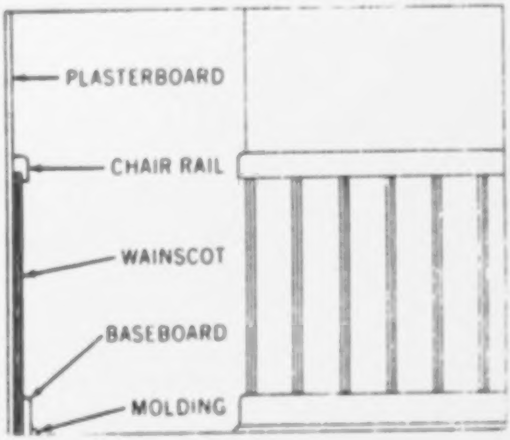

Figure 3. Wood Panel Wainscot

Interior Window and Door Trim

Figure 4 shows some of the molding patterns that are used for interior window and door trim. Note in this figure that the mullion, casing and stool patterns are peculiar to window trim, while the apron, casings and stops can be used for both the window and the door trim. Interior window and door trim is applied after the finish wallboard has been installed.

Door Trim

Interior door casing (trim) is applied to each side and to the top of the door frame, as shown in Figure 5, to cover the space between the jambs and the finished wall. In addition to its decorative features, the casing gives strength to the door frame.

Interior door trim is marked and applied to the frame in much the same manner as exterior trim. That is, a light pencil line is scribed along the jamb (edge) approxiamtely 1/8 - 1/4 inch back from the face. Once the casing position has been established on the door frame, place the side pieces along the line and mark the position of the miter joint at the top where the head jamb line joins the line on the side jamb. Using a miter box or a combination square and finish handsaw, cut a 45° angle on each piece. Using 6d finish nails along the jamb edge and 8d nails along the outer edge, temporarily nail the side casings in place. Mark, cut and apply the head casings in the same manner. If the miters do not fit properly, trim with a block plane or fine toothed handsaw.

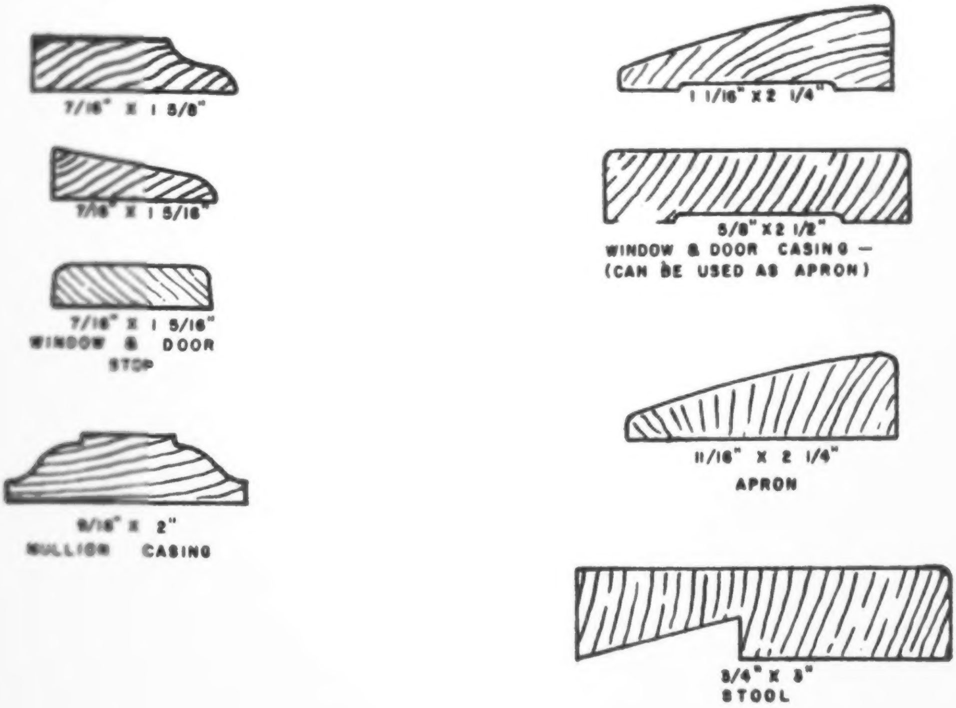

Figure 4. Typical Interior Window and Door Trim

Once the miters have been fitted, complete the nailing pattern as shown in Figure 5.

Window Trim

Interior window casings are applied in a similar manner to that used for door casing. When applying window trim, however, install a stool before applying the casings, as seen in Figure 6.

When cutting and fitting a stool, be sure to allow about 1/16-inch clearance between the front of the lower window sash and the stool, Figure 6. Notice that the stool projects approximately 3/4 inch past the side casing.

Once the stool has been cut and secured, the side casings, head casing, and apron are applied respectively. That is to say, install the stool first, the side casings second, head casing third, and the apron last. Double-hung windows will have the interior trim or casing fastened to the jambs with the appropriate size finish nails, using the same nailing pattern as when applying door casings.

Casement windows will usually have a sill stool and an apron installed without any interior trim or casing. The wall covering material is continued around the window jamb until it is up against the casement sash frame.

Base Trim

The base trim member which is fitted against the wall on top of the finished floor is known as the base. It is usually made up of two members, the baseboard and the base shoe, as shown in figure 7. Frequently, a third member is added. This is called the base cap molding and fits on top of the baseboard. All of these members are nailed with 6d finishing nails.

Ceiling and Wall Trim

The picture mold shown in (A), figure 8, is placed against the wall near the ceiling - usually up against the ceiling. Some builders prefer to lower it to 12 or 16 inches below the ceiling. The cornice mold shown at (B) is usually fitted and nailed against both the ceiling and wall of a room. The chair rail (C) may be placed on the wall at any one of various heights, such as the height of the back of a chair or 48 inches from the floor. The panel mold (D) is used to divide wall spaces into panels. Shelves in closets rest on cleats, illustrated at (E), making it easy to remove the shelves as desired.

SUMMARY

Paneling is one of the commonly used types of wall coverings where appearance is most important. Insuring that all panels are straight and joints are tight, and covered if needed, will insure a professional appearance done in a professional manner.

Interior trim joints are usually one of three types: butt, miter or coped. Interior corner joints are usually coped, while exterior joints are mitered. A scarf joint is used for making splices. Interior trim is nailed 16 inches OC, with finish nails.

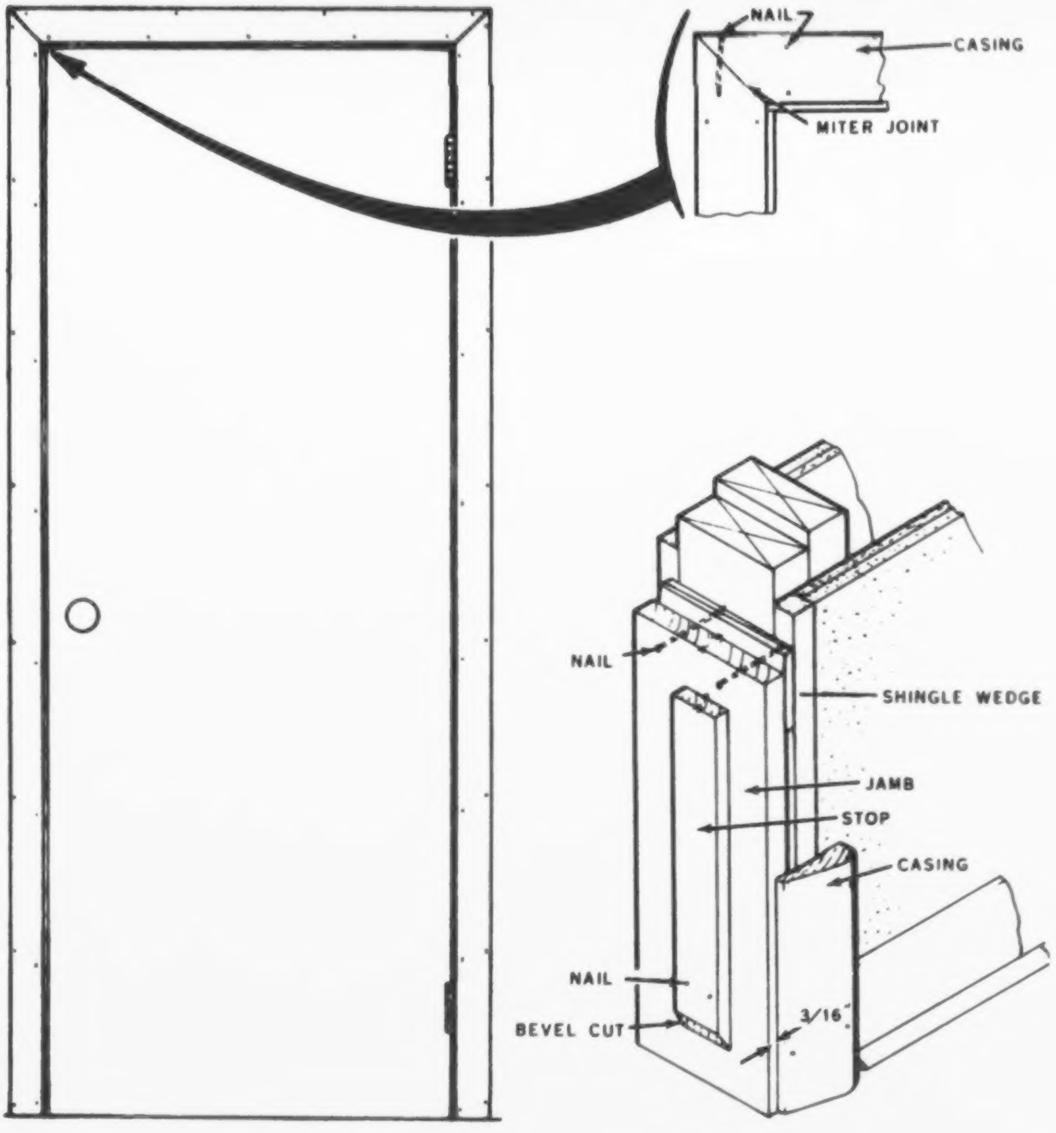
NAIL
CASING
MITER JOINT
NAIL
SHINGLE WEDGE
JAMB
STOP
CASING
NAIL
BEVEL CUT
3/16"

Figure 5. Interior Door Trim Application

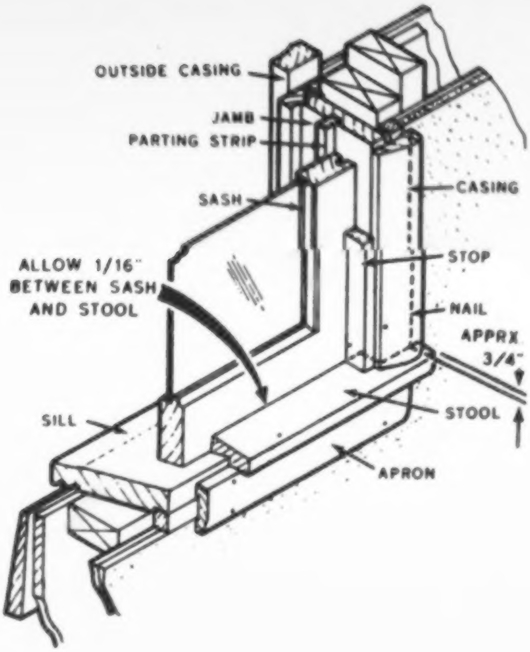
OUTSIDE CASING
JAMB
PARTING STRIP
SASH
ALLOW 1/16" BETWEEN SASH AND STOOL
CASING
STOP
NAIL
APPRX 3/4"
SILL
STOOL
APRON

Figure 6. Interior Trim for a Typical Window

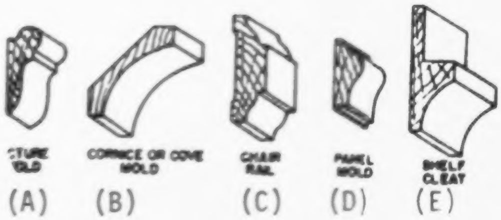
TURE
MOLD
CORNICE OR COVE MOLD
CHAIR RAIL
PANEL MOLD
SHELF CLEAT
(A)
(B)
(C)
(D)
(E)

Figure 8. Ceiling and Wall Trim

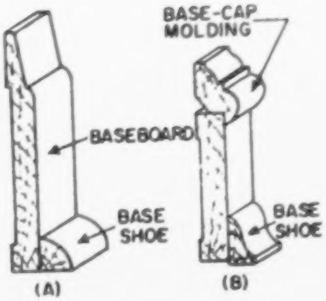
BASE-CAP MOLDING
BASEBOARD
BASE SHOE
BASE SHOE
(A)
(B)

Figure 7. Baseboard and Shoe Mold

QUESTIONS:

Answer the following questions from the textbook. Do not write in the textbook. Use a separate sheet of paper for steps 1 and 2.

1. 6, 7, and 8, page 387.

2. 13, 14, 15, page 443.

3. Match each trim type given in column B with the application which best fits it found in column A.

NOTE: There are more trim types in column B than can be matched with applications in column A.

Column A	Column B
____ 1. Used to support shelves in closets	a. Base shoe
____ 2. The first trim member applied between the finish wall and floor	b. Baseboards
____ 3. You want to divide wall spaces into panels	c. Base floor
____ 4. A trim member used to provide a decorative finish between the wall and the ceiling	d. Base cap
____ 5. A third member frequently added to the base trim	e. Picture mold
____ 6. A trim member placed on a wall at various heights, such as when installing wainscoating. It is sometimes installed at chair back height to provide protection for the wall surface.	f. Chair mold
____ 7. A trim member applied between the baseboard and finish floor	g. Cornice mold
____ 8. Sometimes installed 12 or 16 inches below the ceiling	h. Chair rail
	i. Panel mold
	j. Picture rail
	k. Shelf cleat

3700 Technical Training Group
Sheppard Air Force Base, Texas

SG J3ABR55230 000-V-2

PREFAB BUILDINGS

OBJECTIVE

a. Given incomplete statements identify the procedures for assemblying and erecting prefabricated buildings by completing the statements.

b. Given erection procedures, materials, tools, equipment, foundation and working as a member of a team assemble and erect a prefabricated building must be securely fastened and be within ± 1" of plumb and square.

INTRODUCTION

Today, Air Force installations all over the world are using prefabricated buildings. These buildings are used mostly in localities where materials cannot be purchased locally. To save time and materials, as well as to simplify erection, prefabricated buildings are standardized and available for use in temperate, tropic and arctic regions.

INFORMATION

As a carpentry specialist, you will be erecting prefabricated buildings. Like other structures, they must start with a good foundation. As we follow the procedures for the erection of one of these buildings, you will see that its construction is similar to that of a frame building.

Besides constructing buildings, prefabricated or otherwise, much of your time will be spent in keeping the buildings in good repair. Maintenance and repair work will challenge all of your building skills. You will have the opportunity to inspect work done by others. Some of it was done a long time ago, so it will take a lot of skill and ability to improvise repairs.

This study guide focuses on erecting and maintaining various types of prefabricated wooden and metal buildings.

PREFABRICATED WOODEN BUILDINGS

A prefabricated (prefab) wooden building is assembled with precut members. The joists, plates, studs, rafters, etc., are ready for assembly when they are delivered to the building site. In some cases, the precut pieces may be partially assembled into standard size panels. These panels may be designed for use with a frame, or they may be shaped in such a manner that they can be bolted together to form floors, walls and roofs. Let's look at the construction of each type and the techniques of making repairs.

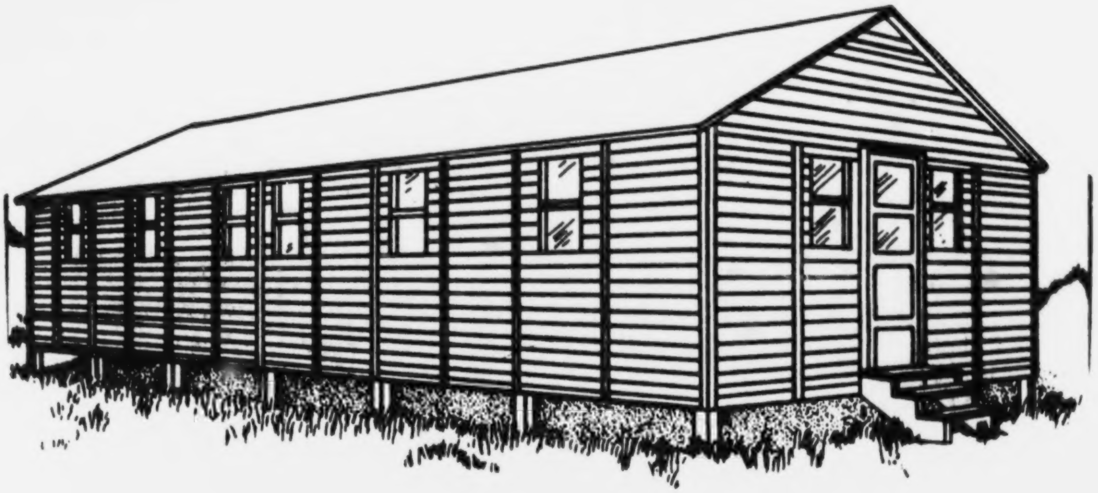

Figure 9. Prefabricated Wooden Building

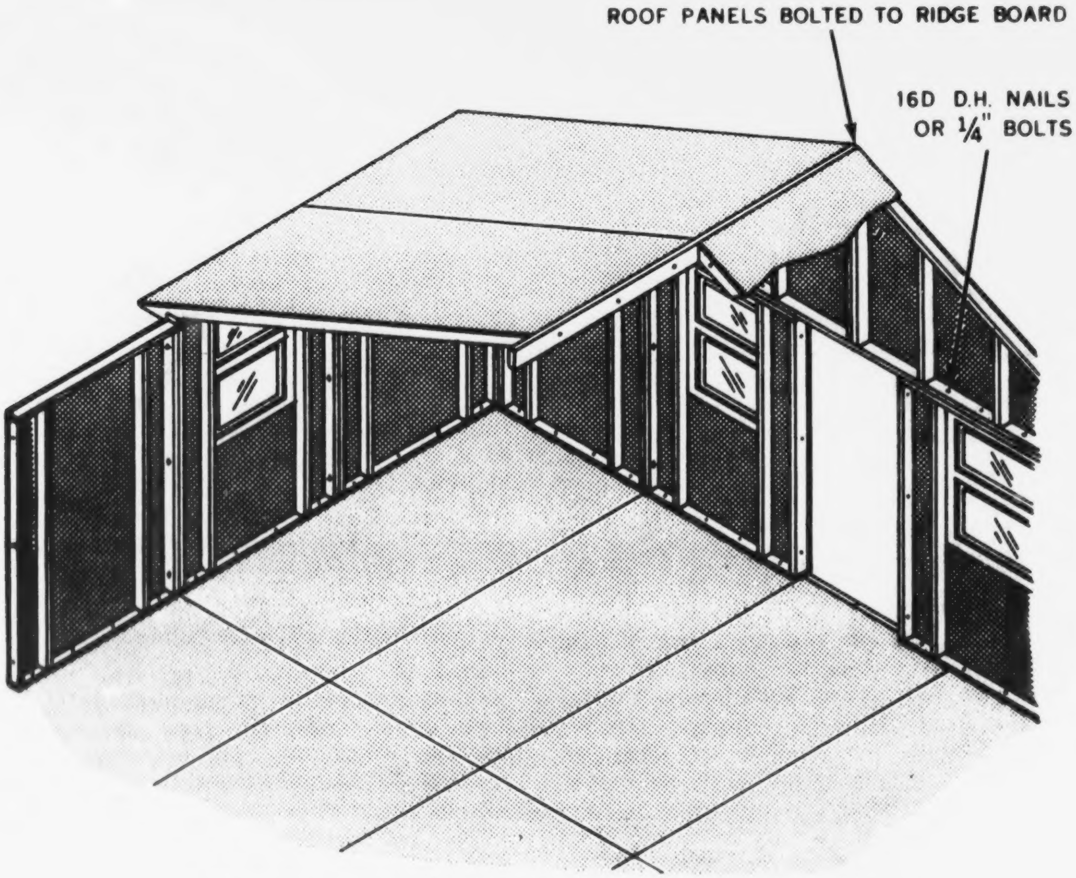
ROOF PANELS BOLTED TO RIDGE BOARD
16D D.H. NAILS OR ¼" BOLTS

Figure 10. Prefabricated Wooden Panel Building

Paneled Prefabricated Building

A wood prefab that is assembled of panels will have an outward appearance similar to the building shown in figure 9. The vertical strips used to cover the joints between the exterior wall panels distinguishes this building as a panel-type prefab. Look at figure 9 and then compare it with figure 10. Figure 10 shows a partially assembled panel-type prefab building, while figure 9 shows a completed building. Note the distinct lines made by the joints between the panels. Also, note in figure 10 that the framework is a part of the panel and that no separate framing is required.

Floor

The floor of a panel prefab building consists of flooring, joists, and girders. The flooring boards are fastened to two or three joists to form a panel 4 feet wide and 8 feet long. The panels are placed on girders that are supported by posts or columns. The panels are fastened in place with screws, and the joints between the panels are covered with a T-shaped metal strip. When plywood is used for the floor, the edges are protected by an H-shaped metal strip that is inserted between two panels. This strip also prevents dust and small objects from collecting in the joint. The panels are easily removed without damaging the edges or the metal strip, if you remove the end or side panels first.

Repairs can be made to individual floor panels in the same manner as repairs are made to floors in other buildings. Also, the panels are interchangeable. Repaired or weak panels may be moved from the main path of traffic and exchanged with stronger panels located in other parts of the building.

There is a variety of floor panels available for this type of building. Some panels have a subfloor, insulation, or both. The type you use will depends on the particular use of the building and the climate. For example, flooring which will hold heavy equipment must obviously be much stronger than that, which will bear light equipment. Panels intended for use in hot, humid climates, such as the Tropics, are not, suitable for use in the cold, low humidity, and dryness of the artic regions.

Walls

The panels used for the exterior walls consist of an exterior covering on a light frame. The covering may be fiberboard, plywood or siding. The frame may be made of 1" x 1", 1" x 2", 1-1/2" x 1-1/2", or 2" x 2", or 2" x 3" inch material. Where insulation is required, a fibrous filler is installed between the exterior and interior coverings.

Doors and windows are assembled within a standard size 4"x 6", 4" x 8" foot panel. The panels are interchangeable so that you can relocate windows, doors and solid sections as desired.

The wall panels are fastened in place with double-head scaffold nails or lag screws (bolts). Bolts are used to fasten two panels together along the vertical edge as shown in figure 10. The fasteners used in this prefab can be easily removed without damaging the panels.

Repairs to wall panels are usually limited to replacing the 1" x 2" or 1" x 4" strips over the vertical joints and replacing the wall coverings. The parts of insulted panels are assembled with glue and cannot be disassembled. You can repair a damaged area on a fiberboard covered panel by installing a fiberboard patch. Make the patch large enough, so that you can fasten at least two edges of it, to the framing members. Use a waterproof cement to fasten the other two edges. Cement may also be used to fasten small plywood or fiberboard patches, if they cannot be fastened to the frame.

Sticking doors and windows are a problem in this type of building when the panels weaken or begin to warp. If normal adjustments do not correct the situation, you may have to strengthen the panel. Replacing the panel covering with new material will give it additional strength. Adding an interior covering on the panel will also help to reduce its flexibility and keep it straight.

The panel type prefab building does not have corner braces. As the building becomes older, it is weakened. Wind pressures may cause the building to lean or shift slightly, causing the windows and doors to bind. You can use guy wires at each corner to help prevent excessive shifting of the panels. The guy wire should be attached at the top of the corner panel or near the eave of the corner roof panel. The other end of the wire may be fastened to a deadman anchor, another prefab building, tree, or any solid structure. These guy wires should be provided for during the original assembly when the prefab buliding is used in an area of strong prevailing winds.

Roofs

Roof panels are built according to the climatic conditions that exist where the building is to be used. A panel that consists of a 2 x 2 inch frame covered with fiberboard is sufficient for some areas. Heavier 2" x 4" frames are used with 1-inch decking or plywood where snow loads are expected. Insulated panels are used in both hot and cold climates.

Roof panels are fastened at the top of the exterior wall panels and at the ridge. A ridge board is placed between the upper end of two roof panels, and bolts are used to hold them together as shown in figure 10. The side members (rafters) of the panel frame are bolted to adjoining panels.

Some roof panels have offset edges so that they fit together with a lap joint like shiplap lumber. This joint helps to align the panels and also helps to prevent leaks. The joints between the panels are sealed by covering them with a bitumen adhesive and cloth strips. Since expansion, contraction, or any other movement of the panels will damage the joint seal, you will probably have to renew or replace the joint seal every year or two. When extended usage is planned for the building, it is best to cover the entire roof with a layer of roll roofing. The roofing can be cut at the panel joints when the building is disassembled.

The roof on the panel prefab building is not as strong as standard wood construction. Therefore, you must be careful when you check or repair the roof panels. Make a temporary walkway by using a 1-x 12-inch board (with cleats) that will extend from the eave to the ridge. When you replace joint seals, start work at one end of the building and work toward the other to avoid walking on or near the repaired areas. Don't walk back across the panels after completing your work. Unnecessary walking on the roof may break the joint seals, requiring you to replace them.

FRAME PREFABRICATED BUILDINGS

The framed prefabricated wooden building is also known as a precut or light frame building. The framing is precut and prepared for assembly before it is delivered to the job site. The studs and rafters are widely spaced as shown in figure 11. Let's take a look at the construction of this type of building.

Floors

The floor of the framed prefab building consists of flooring, joists and girders. A combination subfloor and finish floor is used where a smooth finish or the additional insulating value is required. Girders extend around the perimeter and along the centerline of the building to support the joists. The joists are spaced 24 inches on-center, with each length of joist spanning the distance between the girders. The subfloor is laid either diagonally or perpendicular to the joists. The finish floor, if one is used, is laid lengthwise in the building. This type of building may also be used with a concrete slab floor.

Repairs to the floor consist of replacing individual pieces of flooring. Recovering with a layer of plywood may also be justified if the walls and roof are in good condition. Then the building can be used for several more years. Use a layer of 15-pound felt between the layers of flooring to prevent dust from entering through the joints. Tile and linoleum are not used on wood floors unless the floor is reasonably solid and covered with plywood or hard board.

Walls

The walls in the framed prefab consist of studs, plates, girts and braces. The sidewalls have studs spaced 4 feet on-center and the end walls have studs at the corner and beside the door opening. Single plates are used at the top and bottom of the studs. The bottom, or sole plate, is placed on top of the subfloor and fastened to the subfloor and joists as in platform construction. The girt is a horizontal member located at about the center height of the wall. It serves as a fastening surface for exterior wall coverings. Notice the girts in the foot sheets of plywood that are placed horizontally. The plywood may be placed either horizontally or vertically on the side wall. Sheets placed horizontally help to brace the corners. Knee braces in end sections, as in figure 11, extend from the top plate at a corner to the bottom plate at the door opening. Set-in bracing (short lengths of 2 x 4's nailed between the studs at an angle) may be used in the sidewalls. Corner braces, as shown in Figure 11, extend across a corner, from top plate to top plate, to hold the corner square.

The exterior wall covering may be 1-inch sheathing, fiberboard and insulation panels, or plywood. Rigid insulation boards may be installed as a first covering, followed by a felt membrane, a layer of plywood, and a layer of roofing felt. The roofing felt protects the exterior wall from moisture and eliminates the need for painting. Thin wooden strips or wood lathe are used to hold the roofing felt in place.

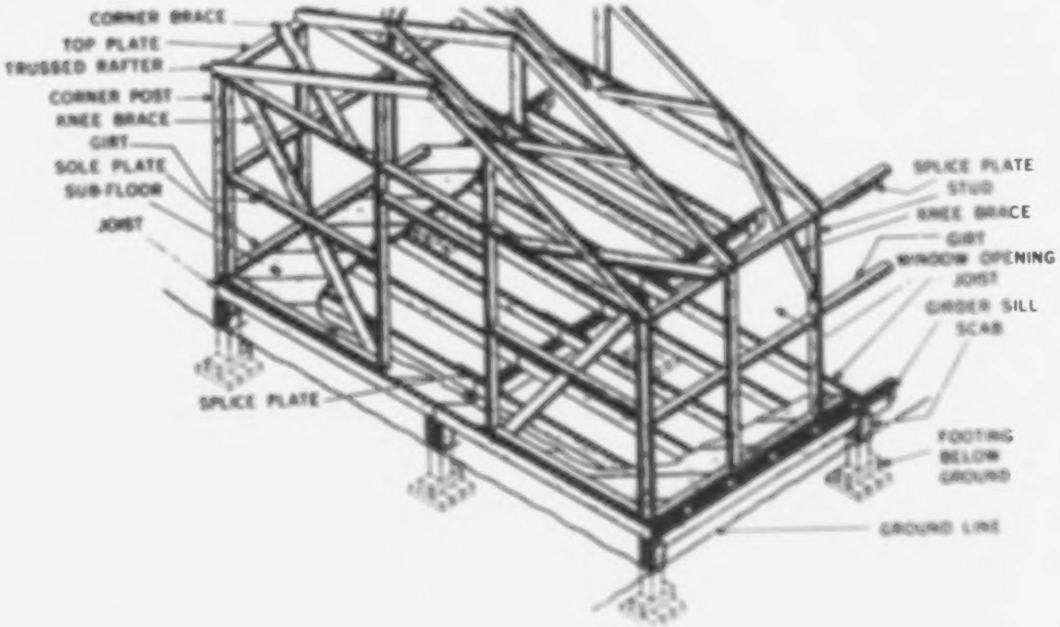
CORNER BRACE
TOP PLATE
TRUSSED RAFTER
CORNER POST
KNEE BRACE
GIRT
SOLE PLATE
SUB-FLOOR
JOIST
SPLICE PLATE
SPLICE PLATE
STUD
KNEE BRACE
GIRT
WINDOW OPENING
JOIST
GIRDER SILL
SCAB
FOOTING
BELOW
GROUND
GROUND LINE

Figure 11. Prefabricated Wooden Frame Building

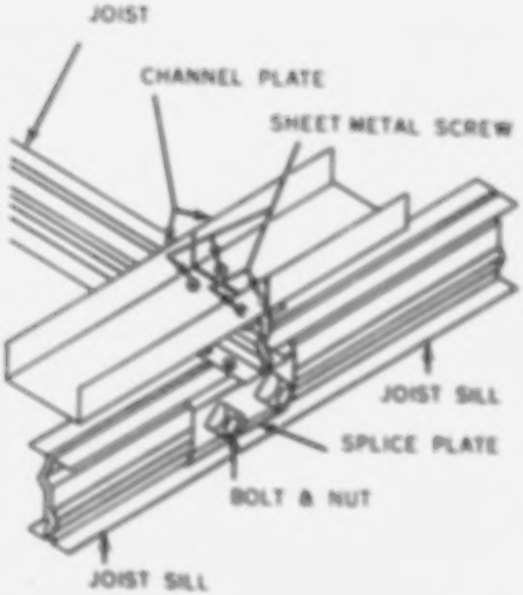
JOIST
CHANNEL PLATE
SHEET METAL SCREW
JOIST SILL
SPLICE PLATE
BOLT & NUT
JOIST SILL

Figure 12. Sill and Joist Assembly

Your work on the exterior walls consists of adding additional bracing, repairing windows and doors, and replacing sheathing and felt. Torn felt should be replaced and fastened with wood strips. Check the wood strips that hold the felt covering in place. Draw loose nails up tight to hold the strips firmly against the felt.

Roofs

The roof consists of precut rafters, ceiling joists, and braces that must be assembled on the job to make a truss. The ceiling joists extend the full width of the building and are fastened to the lower ends of the rafters. The lower end of each rafter is sealed on the top plate of the sidewalls, as shown in figure 12. The joint made by the joist and rafter is very important. The joist helps to prevent the lower end of the rafter and the top of the wall from moving outward. Perhaps you have noticed buildings where the sidewalls bowed outward and the ridge sagged in the middle. This occurs when the rafter and top place pull loose from the ceiling joists. The load on the rafters forces the upper part of the wall outward, and the ridge sags in the middle. This also happens in permanent structures but is most common in light frames, where fewer and lighter ceiling joists are used.

The rafter spacing is the same as the stud spacing, 4-foot on-center. A knee brace fastened to the rafter, ceiling joist, and wall stud is used every 12 to 16 feet for the length of the building. One-inch sheathing boards are used for the roof deck. Roll roofing is used as the roof covering. There is no roof overhang at the eave or gable, and the roof covering is lapped down the side walls to prevent leaks along the edge of the roof.

The interior of the light frame prefab is usually open, and leaks are easily located by a visual inspection. When there is a ceiling in the building, you must locate leaks by entering the attic or going on the roof. Don't walk around on the roof anymore than is absolutely necessary. Instead, the best way to locate a leak is by entering the attic and checking for water marks. Then go on the roof and make the repair. Use a 1 x 12 for a walkway and avoid walking between the rafters. The wide spacing of the rafters allows the decking to sag when you walk on it. Of course, old, brittle roofing may be broken beyond repair, and the only feasible way to fix leaks may be to put on new rolled roofing.

Most repair work on the framed prefab building is similar to the repair work on a standard frame structure. Just keep in mind that this is a light frame building. Repairs to the frame usually consist of nailing splices (scabs) beside the faulty member rather than attempting to replace the frame.

Now that we have studied how to erect and repair wooden prefab buildings, let's see how prefabricated metal buildings are assembled and repaired.

PREFABRICATED METAL BUILDINGS

The prefabricated metal buildings in use on Air Force bases are constructed of many different types of metal. However, galvanized sheet metal and aluminum are the most common metals used in prefab buildings. Most metal prefabs are referered to as portable buildings, because they are easy to disassemble and relocate. When they are no longer needed in one area, they can be shipped to an area where they can serve a useful function. We will concentrate our attention upon two metal buildings that are widely used on Air Force bases: the advanced base hut and the light-steel frame building.

Advanced Base Hut

The advanced base hut is usually referred to as a quonset hut. The standard size is 20 by 48 feet. However, you will find that some of them are two or three times as long as this. They are planned so that they can be assembled in sections 8 feet long to make a building 8, 16, 24, etc., feet long. They are easily adapted for such uses as living quarters, office space, workshops, training areas, and storage of supplies. Nails screws, and bolts used in the assembly of the quonset hut are easily removed when repair of the unit is required. The primary parts of this hut are the floor and the wall, so let's see how they are put together.

Floors

The floor of the hut consists of a metal frame with a plywood covering. The main support of the building is provided by five girders that run the length of the building. These I-shaped girders are spaced 5 feet, 1 inch on-center to provide support for the floor joists. The girder, as we called it in the wooden building, is referred to as an I-beam (its shape) or joist sill (its function) in metal construction. Joists spaced 2 feet on-center are placed on, and perpendicular to the joist sills, as shown in figure 13. A U-shaped channel plate, fastened to the top of the joists, borders the floor and serves as a fastening surface for the end wall studs and arch ribs. Figure 14 shows the arch ribs connected to the channel plate. This channel plate is comparable to the bottom plate used in a wood frame building.

The floor is made of 4' x 8 foot sheets of plywood. Twelve sheets of plywood are placed side by side on the joists, along each sidewall to cover the length of a 48-foot building. The two rows of plywood sheets are butted against the channel plates of the side walls. Six sheets of plywood placed end to end fill the remaining 4 feet in the center of the building. The actual floor width between the channel plates is 20 feet 1 inch or 1 inch more than the two lengths and one width of the plywood sheets used as the floor covering. This 1-inch space is divided between the two center joints to allow a 1/2-inch crack between the ends of the side sheets and the edge of the center sheets. These joints are protected by the H-shaped metal floor splines, as shown in figure 15. This spline protects the edge of the plywood, keeps the joint clean and allows for movement of the plywood sheets. The wide joint and the slip-on spline make it easy for you to remove the center sheets, which are subjected to the most wear. Only 3 or 4 nails are used to fasten a sheet into place. Sixpenny (6d) common nails are driven through the plywood into the groove in the joist. Notice the groove or separation along the top and bottom of the joist shown in figure 12.

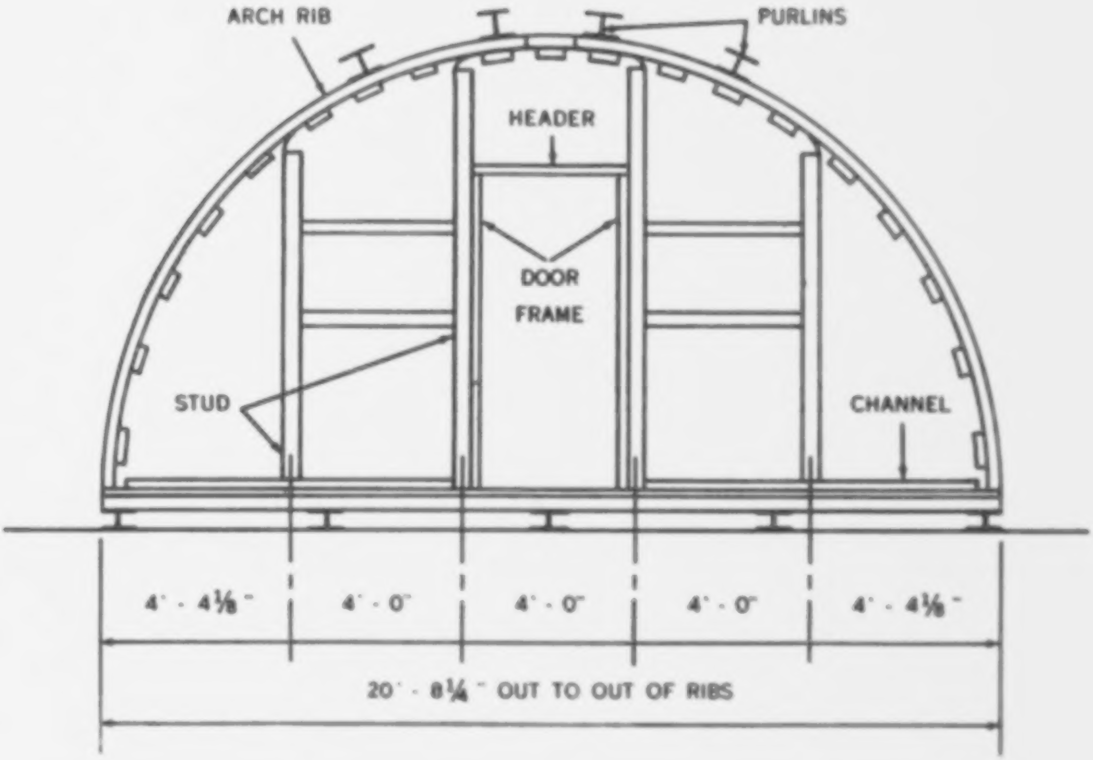
ARCH RIB
PURLINS
HEADER
DOOR
FRAME
STUD
CHANNEL
4' - 4⅛"
4' - 0"
4' - 0"
4' - 0"
4' - 4⅛"
20' - 8¼" OUT TO OUT OF RIBS

Figure 13. End Wall Framing

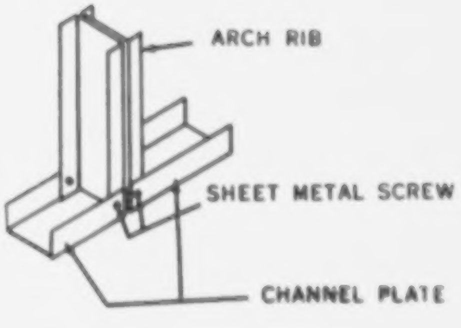
ARCH RIB
SHEET METAL SCREW
CHANNEL PLATE

Figure 14. Arch Rib Joint with the Channel Plate

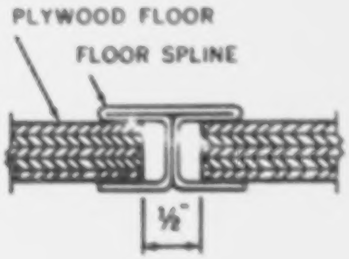
PLYWOOD FLOOR
FLOOR SPLINE
½"

Figure 15. Floor Joint

Walls

The end walls of the hut consist of metal studs, channel plate, window and door headers, and corrugated sheet metal siding. The studs set in the channel are fastened into place with roundhead sheet metal screws. One screw is placed through the inside edge of the channel, and another is placed through the outside edge of the channel. There are four screw holes in the end of the stud, but it is not necessary to fasten through each of them except to splice two lengths of channel plate. Alternate holes, inside right and outside left or inside left and outside right are normally used. To remove a stud, you must gain access to both the inside and outside screws. Figure 13 shows the location of the framing members in an end section. The window and door headers consist of channels that are fastened between the studs. They serve as a fastening point for siding, interior finish and the window or door frame.

The sidewalls and roof are framed with arch ribs, purlins and window headers. The arch ribs are spaced 4 feet on-center and extend from the channel to the ridge or highest point in the building. Two arch ribs are spliced at the peak with splice plates and bolts to form a completed arch. The bottom of each arch rib is fastened in the channel plate with sheet metal screws. Headers for the side windows are fastened between arch ribs. Four purlins are fastened near the top of the arch, as shown in figure 13.

Corrugated sheet metal is used to cover the arch. It is fastened horizontally on the side of the arch to cover the area from the lowest purlin to the joist sill. The curved sheets that cover the top of the arch are placed across the purlins. Vents and roof jacks are built into the rounded sheets that are used on the purlins. These sheets are the same width and length as the others and are interchangeable with them so that you can relocate the vents if necessary.

Repairs to the exterior walls usually consist of replacing the seals or retightening the fasteners around the doors and windows. Figure 16 shows the shape of a rubber seal that is used to prevent leaks at a joint made by corrugated metal and a flat surface.

When insulation is used in the walls of the quonset hut, it is fastened to wooden strips that are placed between the arch ribs. The interior covering consists of plywood panels 1/2-inch thick that are easily bent to fit the inside surface of the arch rib. An H-shaped spline is used along the sides of the plywood, and a wood strip is used to cover horizontal joints. Figure 17 shows the complete assembly as it appears at the bottom of the wall. Be very careful when you remove an inside panel. If you should loosen the adjoining panels, they may spring from the ribs, and you will have more than a handful of panels at one time. Always have another worker with you when you remove the panels or corrugated sheet metal because it is a two-man job.

LIGHT STEEL FRAME BUILDING

The light-steel frame building is used on many bases. It is usually a special-purpose building that has been put up to support one special function. The light-steel frame building is made in different sizes, with different

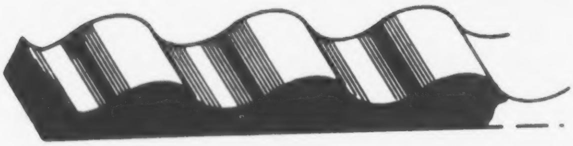

Figure 16. Rubber Seal

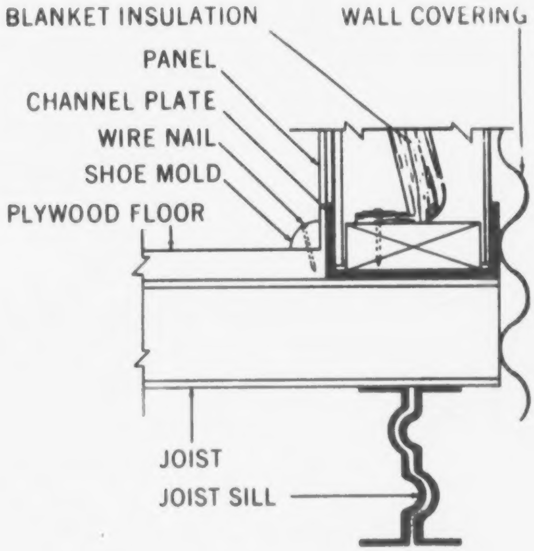
BLANKET INSULATION
WALL COVERING
PANEL
CHANNEL PLATE
WIRE NAIL
SHOE MOLD
PLYWOOD FLOOR
JOIST
JOIST SILL

Figure 17. Exterior Wall Assembly

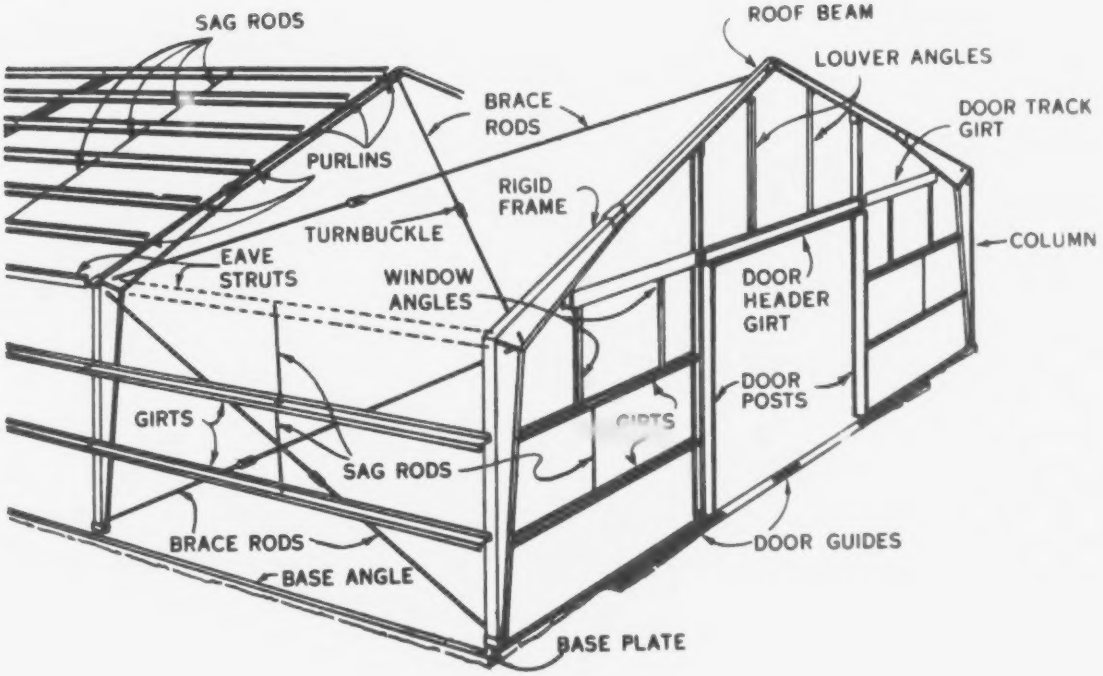
SAG RODS
ROOF BEAM
LOUVER ANGLES
BRACE RODS
DOOR TRACK GIRT
PURLINS
RIGID FRAME
COLUMN
TURNBUCKLE
EAVE STRUTS
WINDOW ANGLES
DOOR HEADER GIRT
DOOR POSTS
GIRTS
GIRTS
SAG RODS
BRACE RODS
DOOR GUIDES
BASE ANGLE
BASE PLATE

Figure 18. Prefabricated Steel Building

types of light-steel frames. The frame is similar to the frames used for buildings of 20- to 50-foot width, with bays 12, 16 or 20 feet long and exterior walls that are 10, 12, or 14 feet high. A bay is the distance between columns along the side walls. A bay is the basic assembly, and a building consists of one or more bays. There is no limit to the number of bays that can be placed end-to-end to form a building. The frame, as shown in figure 18, is often referred to as open-bay construction, because there are no supports needed in the bay. The area between the side walls is open, unobstructed space.

Frame

The end wall frame is assembled from prefabricated parts. Each piece of metal is shaped and drilled for assembly before it leaves the factory. The frame is set up on a concrete foundation or slab. Anchor bolts are placed in the concrete to provide solid fasteners for the columns. because the column is a vertical member, a channel-type base plate is used to secure the column in place. The anchor bolts hold the base plate, and the base plate is bolted to the base of the column.

Roof beams, extending from the top of the column to the peak of the roof, from the main supports for the roof. The roof beams follow the path of the common rafters and are joined at the ridge with splice plates and bolts. Splice plates are placed on the top, bottom, and sides of the roof beams at the ridge.

End wall posts, or door posts, extend from the foundation to the roof beam and are bolted in place at each end. The door frame is attached to the door posts. The door header is fastened to the door header girt, which extends between the door posts. A girt that extends from column to column across the end of the bay may also be used to secure the door header and tracks when a sliding door is used. A base angle (90° angle) is fastened to the foundation between the columns to provide a fastening surface for the vertical siding. The top of the siding is fastened to an angle that is attached to the roof beam. The eave strut provides a surface for fastening the top of the sidewall penels. The intermediate fastening surfaces are provided by horizontal girts on both girts on both end and side walls.

The sag rods, as shown in figure 18, are used to prevent the girts from sagging between the columns. Sag rods are also used in the roof frame to help hold the purlins in line. The rods may be thin channels that clip in place and are not adjustable, or they may be threaded rods that can be adjusted. These rods should be kept tight, but overtightening will force the girts out of line and pull the screws loose in the siding.

Angles are installed vertically to frame louvers and windows. The angles for the louver form a frame in the upper part of the gable and provide a fastening surface for the louver frame and the siding. Angles also fit between the Z-shaped wall girts to provide a fastening surface for the window frame.

Notice the brace rods in figure 18. These brace rods are used to square the end bays of the building. The brace rods in the wall run diagonally from the top of one column to the bottom of the adjoining column. The rods pass through slots in the columns, and a bevel washer, flat washer, and nut are used on the ends of the rods. Turnbuckles are used at an intermediate point in the rod to provide for adjustment. The turnbuckle has a right-hand thread in one end and a left-hand thread in the other so that it can be tightened or loosened on each section of the rod at the same time. Adjustments may also be made by tightening or loosening the nuts on the ends of the rods. When you tighten one rod, you must loosen the one that crosses it to provide for a shift in the framing. The brace rods between the roof beams serve to hold the bay square and must be considered if you adjust the brace rods enough to cause a shift in the frame.

Wall and Roof Coverings

The metal wall covering may be a panel that contains a layer of insulation, or it may be some other type of material, Figure 19 shows two insulated panels joined together with a vertical joint. With this type of installation, the T-bar is secured to the wall girts, and the metal weather seal is placed over the T-bar to provide a durable, moistureproof joint. The next panel has the insulation butted against the weather seal, and the metal siding laps over the previous sheet to form a lap joint of 1-1/2 laps. A mastic seal is applied to the area of the lap before the second panel is installed. This mastic seal is permanent and should never have to be replaced, except when the panel is replaced, or the building is disassembled and relocated.

Another type of ribbed wall panel that has an insulated core is shown in figure 20. This panel has vinyl seals inserted along the edges. The vertical edges fit together with a tongue and groove joint to make a weatherproof joint.

The lap joint and the vinyl seal joint are the two common methods used to make weatherproof vertical joints in exterior walls. The mastic seal used in the lap joint of insulated panels is also used with sheetmetal siding and roofing. The mastic comes in strips with moistureproof paper backing that looks like masking tape. The strips are rolled like tape for easy handling. You unroll the tape and apply the mastic and backing to the joint area. Leave the paper backing on the mastic until you are ready to cover the joint. This mastic is also required for the horizontal joints of the roof panels to prevent water from being blown under the top panel.

When horizontal joints are required in a wall, they are formed by lapping an upper panel over a lower panel, as shown in figure 21. A Z-shaped bar is used at the girt where the splice is made. The metal covering of the lower panel extends above the Z-bar, and the metal covering of the upper panel laps over the lower panel to form a 6-inch lap joint.

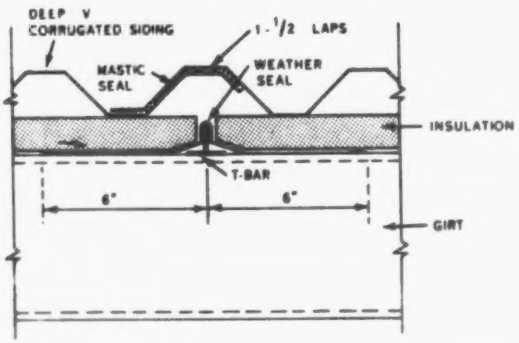
DEEP V CORRUGATED SIDING
1-1/2 LAPS
MASTIC SEAL
WEATHER SEAL
INSULATION
T-BAR
6"
6"
GIRT

Figure 19. Deep V-wall Panel

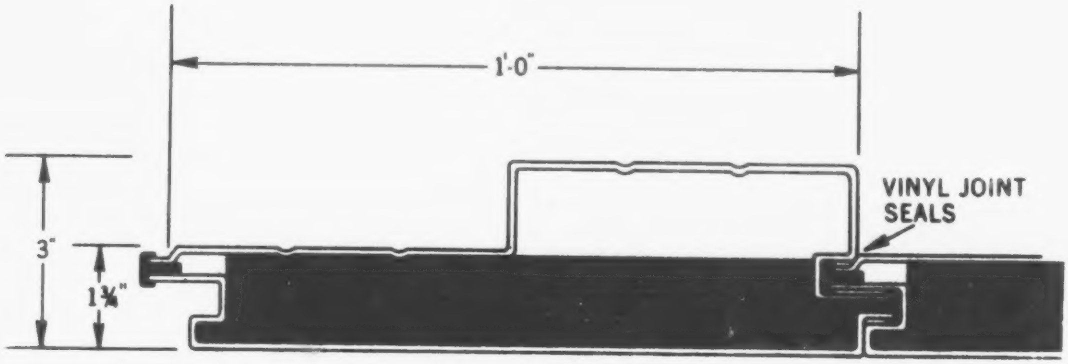
1'-0"
3"
1¾"
VINYL JOINT SEALS

Figure 20. Ribbed Wall Panel

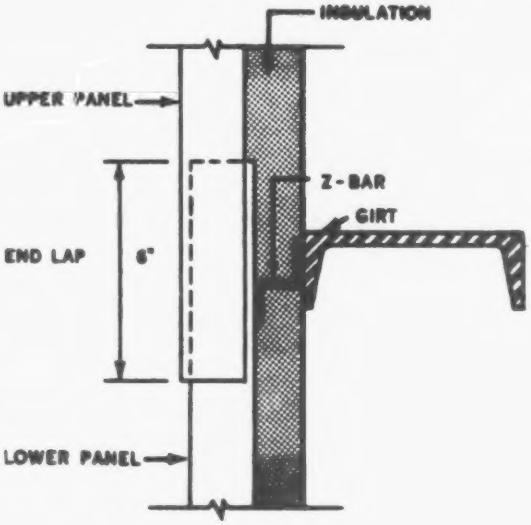
INSULATION
UPPER PANEL
Z-BAR
GIRT
END LAP
6"
LOWER PANEL

Figure 21. End Lap of Exterior Wall Panel

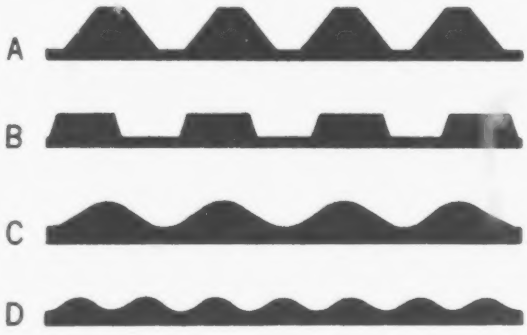

Figure 22. Rubber Seals

A solid rubber seal is used to make a waterproof joint where ribbed panels overlap a smooth surface. Figure 22 (A, B, C and D) shows the shape of the rubber seals used with roof and wall galvanized sheet metal panels (A), aluminum ribbed panels (B), asbestos-cement panels (C), and corrugated glass panels (D). These seals are placed under the panel to prevent moisture from getting between the panel and the smooth surface.

Special rubber seals may also be used at eave struts, as shown in figure 23. Metal closure strips may be needed, in addition to the rubber seals, to close the space between the ribs of the panel.

Figure 23 also illustrates the type of information you can get from the master file of drawings in your drafting section. This drawing shows a side view of each part of the eave assembly. Check your drawing file to locate hidden parts of the building so that you can plan your work accordingly.

Sheet metal siding is fastened to the girts, base angle, and eave strut or gable angle with self-tapping sheetmetal screws. When fastening steel to steel, you can use steel screws or cadmium coated, rust resistant screws. These coated screws are also used to fasten aluminum panels to steel frames.

When aluminum panels are placed on a steel frame, some type of separator must be used between the different metals to combat corrosion. This separator is usually provided by coating the steel (area of contact) with an asphalt paint. You can also use a layer of waterproof paper or asphalt saturated felt as the separator.

In metal construction, it is frequently impossible to prevent the contact of dissimilar metals. This contact may result in corrosion of one of the metals and the protection from corrosion of the other metal. This is galvanic action or electrolysis that occurs when metals of different position in the electromotive series are in direct contact in the presence of an electrolyte. The common metals used in construction are listed in the electromotive series in the following order: 1-aluminum, 2-zinc, 3-iron, 4-tin, 5-lead, 6-copper. When any two dissimilar metals in this list are in contact in the presence of an electrolyte, the one with the lower number becomes corroded. Also, the farther the separation in the list, the greater the corrosion will be. Thus, with iron and copper in contact in the presence of water, the iron would be corroded more than lead in contact with copper under similar conditions. Any means that separates dissimilar metals will protect against this action.

Perhaps you are beginning to wonder how dissimilar metals can be used in layers as a single sheet of metal. Let's take lead-coated copper as an example. The lead coating on the copper is of a lower number value in the electromotive series and is affected by the corrosion. Also, the two metals are consecutive (5 and 6) in the series, and a minimum amount of corrosion is anticipated. The purpose of the lead coating is to protect the copper; in this case, it protects it in two ways, physically and chemically.

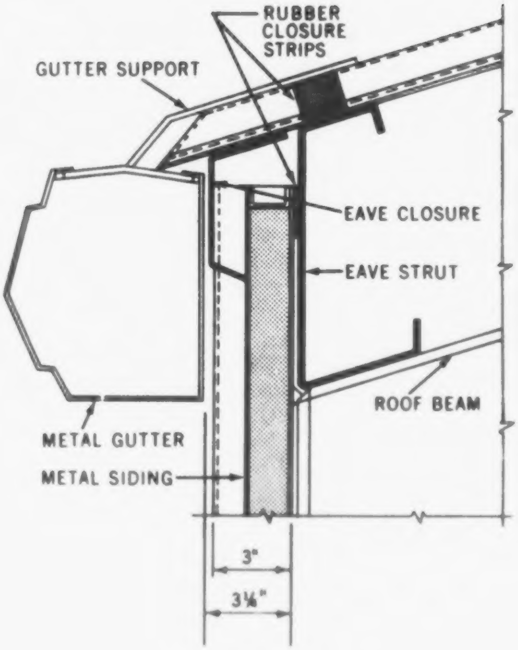
RUBBER CLOSURE STRIPS
GUTTER SUPPORT
EAVE CLOSURE
EAVE STRUT
ROOF BEAM
METAL GUTTER
METAL SIDING
3"
3⅛"

Figure 23. Eave Assembly

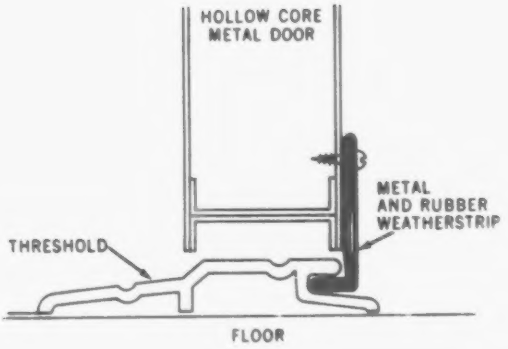
HOLLOW CORE METAL DOOR
METAL AND RUBBER WEATHERSTRIP
THRESHOLD
FLOOR

Figure 24. Weatherstrip Installation

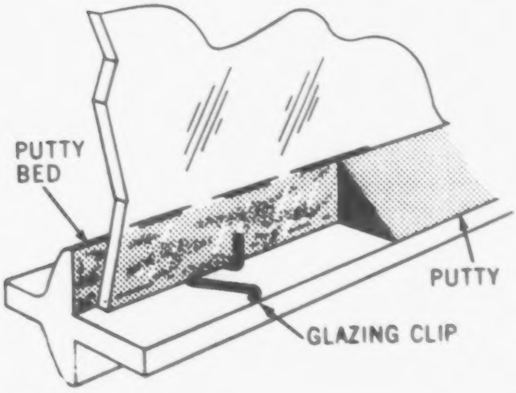
PUTTY BED
PUTTY
GLAZING CLIP

Figure 25. Glazing Metal Sash

Doors and Windows

We have discussed the location and fastening of door posts and window angles. Now let's see how they are installed.

Metal doors are preferred for prefabricated metal buildings. There are two types of these doors. One type has an angle iron, steel, or aluminum frame and a single metal covering that serves as the exterior surface. The frame is exposed on the inside of the building. The other type of metal door has a metal frame with a metal covering on each side. This door is built like a flush door and may have either a hollow or insulated core.

Metal doors seldom need repairing. Maintenance usually consists of tightening or replacing screws in the hinges and weatherstrip. Occupants usually correct the problem of loose screws and bolts, but you will problably be called on to supply new or larger screws. When retightening of screws is required at frequent intervals, you should substitute a screw that is one size larger than the old one, or relocate the hinge and make new screw holes. The weatherstrip on the jamb causes very little trouble, but the strip along the bottom of the door may get damaged or become loose. This threshold strip extends beyond the lower edge of the door and hooks into a groove in the threshold, as shown in figure 24. Make sure that the strip is adjusted so that it fits into the groove. This type of threshold and weatherstrip is common on exterior doors that swing over concrete floor.

Window maintenance consists of tightening the mounting screws in the frame, side panels and the U-shaped drip channel (gutter). Replacing glass in a metal sash is a little different from working with a wood sash. When you remove the old putty from the sash, you must locate and save the metal glazing clips. Look at the glazing clip in figure 25. This clip fits between the edge of the glass and the frame. One end of the clip fits into a hole in the frame, and the other end hooks over the edge of the glass. Allow for the thickness of these clips when you cut the new glass. Place a bed of putty on the frame and press the new glass gently against it. Use a screwdriver to install the glazing clips. The clips will hold the glass in place while you are applying the beveled layer of putty around the edge of the glass.

Now that you have learned how to erect and maintain various wooden and metal prefabricated buildings, let's look into some other aspects of your job: resource management, supervision, and training.

SUMMARY

Metal buildings have some distinct advantages over wooden buildings. They have a longer lifespan due to the fact that they don't deteriorate rapidly. Construction is easy. If you can read instructions, you can assemble the building. The most important thing to remember when erecting prefabs is to follow the manufacturer's instructions.

QUESTIONS

Answer the following questions from the textbook, Modern Carpentry. Do not write in the textbook.

1. Unit 21, page 511 questions 1-7.

Use the information in the study guide to answer each of the following:

1. Place an X beside each of the following items if it is correct; otherwise leave it blank.

    ____ 1. When plywood is used for the floor of a prefabricated panel building, H-shaped metal strips are inserted between the panels to prevent dust and small objects from collecting between the panels.

    ____ 2. Floor panels for a prefabricated panel building rest directly on post or columns and therefore eliminates the need for girders.

    ____ 3. All floor panels are interchangeable. Worn panels, for example, can be exchanged with those near the edge of the room wire little foot traffic occurs.

    ____ 4. The standard sizes of wall panels for a prefabricated paneled building are 4 x 6 feet or 4 x 8 feet.

    ____ 5. The wall panels of a prefabricated building are normally fastened in place with double-head scaffold nails or lag screws.

    ____ 6. Repairs to wall panels are usually limited to a complete replacement of the damaged panels.

    ____ 7. The parts of insulated panels are assembled with glue and cannot be disassembled.

    ____ 8. Guy wires are placed at each corner of older prefabricated panel buidings to prevent excessive panel shifting.

    ____ 9. Roof panels for prefabricated buildings are selected according to climatic conditions.

    ____ 10. A temporary walkway should be used when repairing or otherwise working on a prefabricated roof.

2. Match each type of construction given in column B with its corresponding descriptive statement found in column A. NOTE: Every item in column B matches with one or more items in column A.

Column A

____ 1. The studs and rafters are widely spaced.

____ 2. This type construction is sometimes used with a concrete slab floor.

____ 3. Is commonly used in modern construction.

____ 4. This framing is distinguished by floors (two story and higher) independently framed.

____ 5. Single bottom and top plates are used.

____ 6. Service pipe's and wires are more difficult to install after the outer wall covers are installed.

____ 7. Wall studs commonly spaced 4 feet on center.

____ 8. Girts are installed about the center height of the walls.

____ 9. Roofing felt held in place by thin strips of wood is installed to protect the wallboard from the weather.

____ 10. A knee brace fastened to the rafter, ceiling joist, and wall stud is used every 12 to 16 feet.

Column B

a. Prefabricated frame building

b. Platform framing (western type)

3. For each of the following items, place a checkmark ( ) beside it if it is correct with reference to advanced base hut construction. Otherwise, leave the space provided blank:

____ 1. Brace rods are employed to help aline and square individual bays.

____ 2. A base hut is sometimes known as a quonset hut.

____ 3. The standard size base hut is 20 x 48 feet.

____ 4. Sag rods are used to prevent the girts from sagging between columns.

____ 5. The floor consists of a metal frame with a plywood covering.

____ 6. The sidewalls and roof are framed with arch ribs, purlins, and window headers.

____ 7. Main wall and roof support are spaced 4 feet on center and extend from the floor to the ridge.

____ 8. When insulation is installed, it is installed to wooden strips attached to the main wall support designed for the purpose.

FLOORING, CAULKING, AND PREBFAB UNITS

OBJECTIVES

a. Given incomplete statements identify procedures for installing, repairing or replacing flooring, caulking and prefab units by completing the statements.

b. Given procedures, a wooden floor, tools, materials, equipment and working as a member of a team repair a damaged area of flooring with no more than two instructor assists. The repaired area must be securly fastened and match the existing floor.

c. Given procedures, a tiled floor, tools, materials, equipment and working as a member of a team repair a damaged section of flooring with no more than two instructor assists. The repaired area must be securely fastened with no bulges, and all joints must be tight.

d. Given procedures, a prefabricated cabinet or bookcase, tools, materials, equipment and working as a member of a team install the cabinet or bookcase with no more than two instructor assists. The installed unit must be securely fastened, plumb, and level.

e. Given procedures, tools materials, equipment and working as a member of a team caulk windows with no more than two instructor assists. Caulked areas must be overlapped 1/8" and present a smooth even surface.

INTRODUCTION

One of your duties as a carpentry specialist is to install maintain and repair flooring. This flooring can be constructed of various materials such as wood, tile or asphalt and vinyl.

INFORMATION

WOOD FLOORING

Wood used for the finished floor should always be well seasoned. Why? Because nonseasoned lumber will shrink and leave openings between the flooring strips. Flooring, except for beech, birch, or maple, is sawed from a log in two ways - either as quarter-sawed (edge-grain) or as plain-sawed (flat-grain). Flat-grain softwood flooring is not recommended for permanent structures, although it may be used occasionally in temporary buildings where paint is applied for a finish. Because edge-grain lumber has greater wearing qualities, it is best for floors expected to receive abnormal amounts of wear. Regardless of whether flat-grain or edge-grain lumber is used, some of the pieces will have a more vertical grain than others. These pieces should be specially selected and used in doorways or other areas of excess traffic because of their greater resistance to wear.

Finish flooring laid on a subfloor may be of either hardwood or softwood depending upon the use of the building and the cost of flooring. Oak flooring is usually considered the most desirable hardwood for finished flooring in residential-type buildings. It is available in both red and white oak, either quarter-sawed or plain-sawed.

Maple, although usually more expensive than oak, is more desirable for use in roller skating rinks, bowling alleys, and similar places, because it will stand more rough usage and maintain its finish longer than any other type of wood floor.

Softwoods used for flooring are divided into two grades--select and common. The "A" and the "B and Better" select grades are used when floor is to be stained, varnished, or waxed; whereas the "C" and "D" select grades are used for floors to be heavily stained or painted.

Installing Wood Floors

Before starting to lay the finish flooring, be sure that the subfloor has been swept thoroughly to remove all scrape material. Place heavy felt building paper over the subfloor to provide insulation and to cushion the finished floor. Hardwood flooring is usually packaged in small bundles of random length pieces. It has a tongue and groove on the sides and ends to insure good tight fit. Because it has this tongue and groove on the ends, cutting is eliminated except at the side or end of a room. Soft-wood flooring usually comes in standard-length pieces, with a tongue and groove on the sides, but not on the ends. This is why it is necessary to cut the pieces in order to break or stagger the joints. These cuts should be made exactly square across the face of the pieces. It is customary to undercut the flooring, as illustrated in figure 26, to make a good tight fit when the material is not end matched (with tongue-and-groove ends).

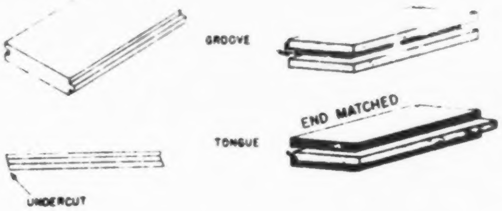

Figure 26. Undercut To Insure Tight Fit.

When laying floor over old floors, all protruding nails must be hammered down; loose boards nailed; warped boards replaced; and high spots leveled. For best results, machine sanding is recommended for the old floor before laying the new floor. Before sanding, remove all thresholds, base shoes, baseboards, and interior doors. After sanding, sweep the floor clean; and place building paper, usually 15-pound felt, on the old floor before you lay the new floor. Also, the new flooring should run at right angles to the old floor.

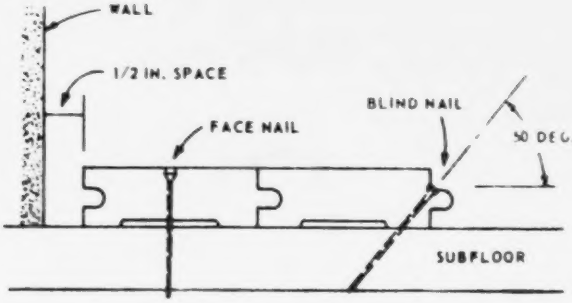

Figure 27. Nailing pattern for strip flooring.

The first strip of flooring should be placed approximately 1/2 inch from the wall as shown in figure 27 with the grooved edge toward the wall. This piece should be faced-nailed close to the wall so that the nailheads will be covered by the baseboard and shoe mold. Each additional strip of flooring must be forced tightly against the strip previously nailed. You can do this by hammering against a short, scrap piece of flooring which protects the tongue. Cement-coated nails are used for flooring because of their holding power. Drive these nails on the tongue edge at approximtely 50° to help draw the piece up tight. This is called blind nailing, because the nailheads are covered by the next piece of flooring. When laying a floor, stand with your toes on the piece being nailed and bend over from the waist to drive the nail. By working in this position, you can hold the piece in place and drive the nail with an easy motion. Also, there is less possibility of damaging the piece when the nailhead reached the board. The ends of adjacent pieces should always be staggered to prevent a continuous joint across two pieces. The end cut should be slightly undercut (less than 90°). This undercut end is forced tightly against the end of a square-cut board to make a tight joint.

End-matched boards have the tongue and groove extending around the ends of the board; and the boards are of random length, making it easy to offset the end joints. Boards that are not end-matched are cut square across the board, and it is up to you to space the end joints.

Wooden parquet floors, as shown in figure 28, consist of tile-size wood blocks. Tongue-and-groove strips of wood are assembled to form square tile. Some tiles are glued together; whereas, others have several metal straps across the back of the strips to hold them together. Four or five strips are placed together to form a square tile.

The squares are glued to a slab or subfloor to form various design. The usual pattern is to place the second tile with the strips running perpendicular to the strips in the first and third tiles. The grain of the wood in one tile runs perpendicular to the adjoining tile. For this reason, you do not refinish these floors by using the usual sanding procedures, as with hardwood flooring.

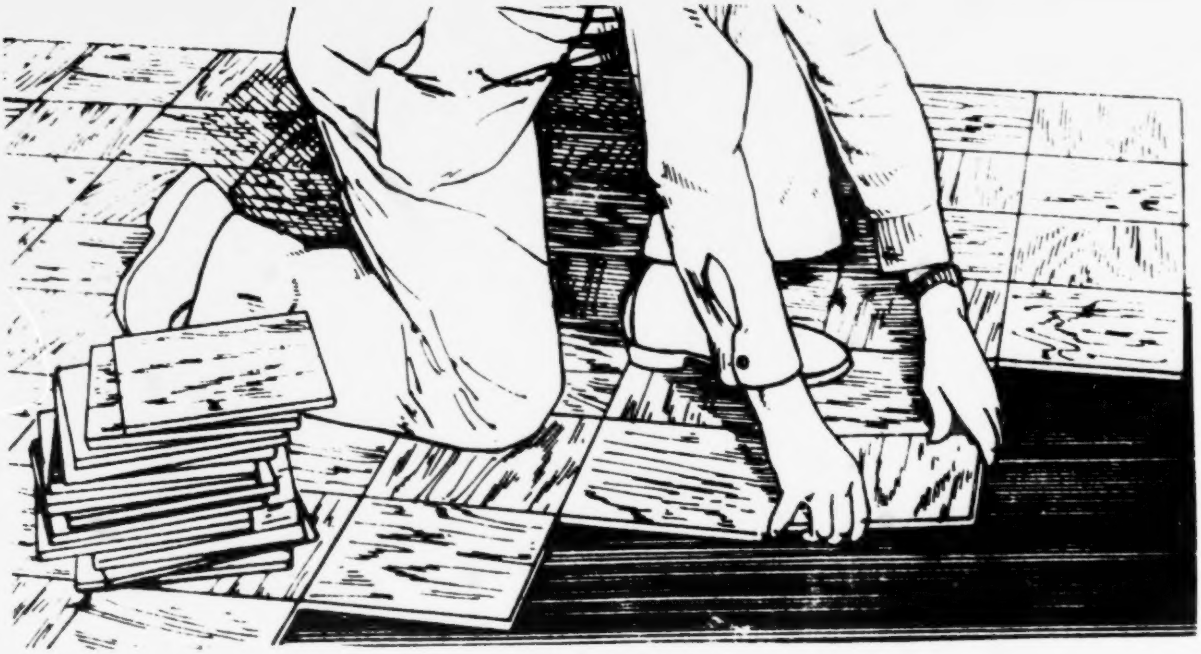

Figure 28. Installing wood parquet.

Maintaining Wood Floors

Wood flooring is easily maintained if it is kept clean and is not soaked with water during the scrubbing process. Most wood floors now have a wax finish and are under control of user maintenance. Damp-mopping and an occasional scrubbing by the user can do more to extend serviceability of wood floors than we can. There are some areas at the bottom of stair wells and in front of exists and latrine doors exposed to excessive amounts of water. There are some areas at the bottom of stair wells and in front of exits and latrine doors exposed to excessive amounts of water. This water penetrates the finished floor, causing the edges of the boards to turn up and open some joints. The water passes freely through open joints to the subfloor and joists below. Some water remains in the joints and between the joists and subfloor and between the subfloor and finished floor. The same problem exists in many two-story barracks, even when tile or other coverings are used at the base of the stairs. When these problems are noted, the source of water should be located. If the water is due to stair scrubbing and flooding, the method of cleaning the stairs must be changed. If the water is entering the room through an exit door, the door will have to be put into good condition and properly fitted in the jamb. A metal flashing can be installed above the door to direct water away from the head jamb. A J-strip or other seal can be used between the bottom of the door and the threshold to stop entry of water at this point. If you don't locate the problem in time to take corrective action, it is almost certain you will have to replace some flooring.

Subflooring

The subfloor is also kown to some craftsmen as underfloor, rough floor, or base floor. It is laid directly on top of the floor joists and helos to strengthen and align the top edge of the joists. It serves as a nailing surface for finished floor. The joints in the finished floor (unlike wall siding and roof sheathing) are at random intervals and are not necessarily located on the joists. Subflooring also helps to deaden sound, insulate, and prevent dust from rising upward through the finish floor.

The replacement of subflooring, either boards or plywood, is done by cutting out the damaged portion of the subfloor and replacing the subfloor with like material of the old subfloor. The last piece of tongue-and-groove material to be put in place should have the bottom groove removed before it is installed and nailed into place.

Finished Floor

It may be necessary for you to replace damaged pieces of finished flooring when it is worn thin, marked or buckled. You can remove the section to be replaced by first using a framing square to establish a line at right angles to the long side of the flooring, then use a chisel and mallet. Chisel into the flooring at the mark. Remove the flooring a little at a time until the subfloor is reached, then split out the remaining flooring (figure 29).

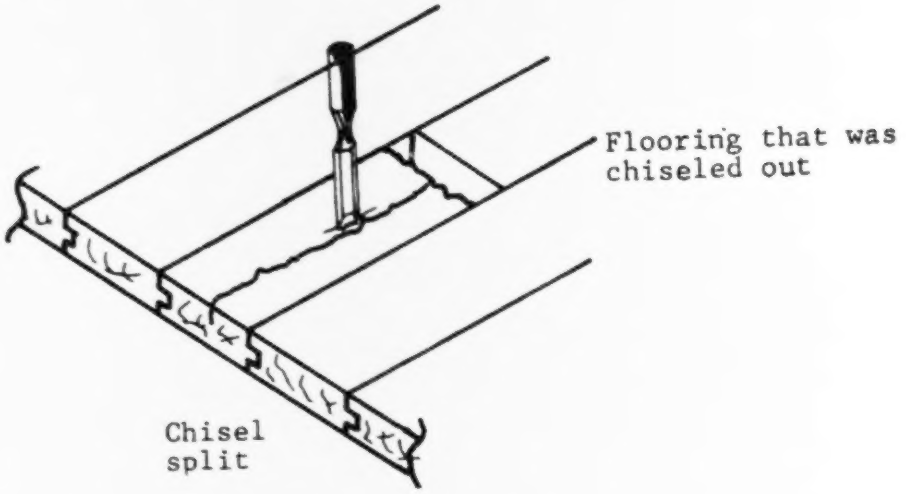

Figure 29. Removal Of Damaged Section Of Finished Flooring.

When the damaged piece has been removed, a new piece of flooring should be cut to fit tightly into the section being repaired. Before inserting the piece into the hole, you must remove the bottom part of the grooved edge to allow it to slip into place easily. After you have placed the piece, as shown in figure 30, face-nail with finishing nails. If the piece is likely to split, drill holes for the nails. Set heads of the nails slightly below the surface and cover them with wood filler before the finish is applied to the floor.

Repair of wood parquet floors usually consist of filling and hand sanding, or replacing units. Use extreme care when removing a tile to prevent damage to the edges of the adjoining tiles. Work from the center of the tile outward to prevent this damage to adjoining tile. Parquet flooring can be refinished using a sander. However, the top ply (finished surface) is rather thin. For this reason, it requires a delicate sanding, using three grades of sandpaper, and must be finished by buffing.

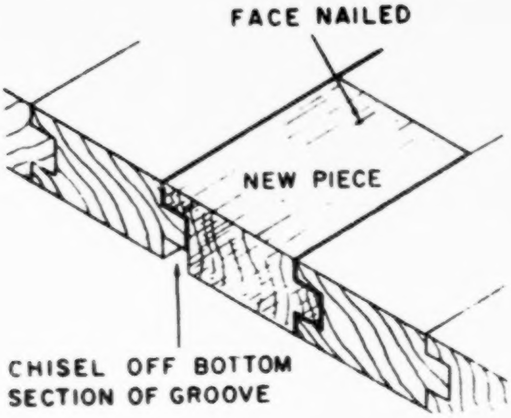

Figure 30. New Section Should Be Face-Nailed.

NONWOOD FLOOR COVERINGS

These coverings consist of the various kinds of tile and linoleum used as floor surfaces. Very few installation problems exist when these coverings are used on new floors properly prepared for them; however, to place them over old floors usually requires some additional work to prepare the surface.

Preparing the Surface

Before any of the nonwood floor materials are applied over wood floors, be sure that all loose boards have been adequately nailed, cracks properly filled, and the entire floor machine-sanded. When a concrete base is to be covered, be sure it is clean, dry, and free of dust. If the floor is below ground level or over a poorly ventilated area, the wood or concrete base may be affected by moisture. In this case, asphalt tile is usually recommended, because other floor coverings may be damaged by moisture.

Wood floors which have become unsanitary or hazardous may be economically repaired by application of a flexible or semirigid floor covering. Let's discuss some of these materials to see how they are used.

Felt

The use of felt under most nonwood floor covering is recommended, because it will lengthen the life of the covering. The felt is available in rolls 3 feet wide. Cut it to fit around pipes and other obstructions. Where two strips of felt join, butt them together. Never overlap the edges because the double thickness will create an uneven base, thus causing uneven wear of the finish covering. Also, cut the felt for an entire room before pasting any of it down.

Plywood

Plywood underlayment should not be less then 3/8-inch thick, 3 ply, with moisture-resistant glue.

Fiberboard

Hard fiberboard for underlayment should be 1/4-inch thick. Fiberboard is made by compressing fibers of wood or other substances into thin, stiff sheets. It is commercially available in standard 4 x 8 sheets.

Semirigid Board

A semirigid asphalt saturated board is available in thicknesses of 3/16" and 1/4" and a sheet size 36 x 40 inches. This board, highly resistant to moisture, will not warp or buckle when exposed to high humidity. It can be cut and trimmed with a linoleum knife.

Trowel-applied Underlayment. This underlayment consists of floor mixes laid to a thickness necessary to provide a smooth surface. These troweled-on underlayments may be described as latex-type leveling course, asphalt-type leveling course, floormatic, latex liquid felt, etc.

TYPES OF FLOOR TILE

Many different types of floor tile (resilent floor coverings) are available. They may vary in thickness, size shape, and installation methods. Regardless of the type you may become involved with, you should give special attention to the manufacturer's instructions regarding the type of tile. You should pay particular attention to the method of application and the conditions under which the installation should be made. Because of these factors, each flooring application will vary to some degree. With this in mind, let's continue our discussion about the types of resilent floor coverings.

Vinyl-Asbestos

Vinyl-asbestos tile is the most commonly used type of tile in construction today. Its princple advantages to you are in the many areas where it can be laid. Vinyl-asbestos tile can be installed on above or in below-grade construction. The type of tile does not require waxing and buffing; this only gives it a shine. Asbestos fibers and a mixture of vinyl resins are used to manufacture vinyl-asbestos tile. It is available in a wide variety of colors and in sizes of 9" x 9" or 12" x 12". The color and gloss of vinyl-asbestos tile is less brilliant than on pure vinyl tiles. Scratches and soil will not be as visible on vinyl-asbestos tile as they will be on other types. Most vinyl-asbestos tiles have the vinyl-formula wear surface fused to the vinyl-asbestos. The most common thickness of vinyl-asbestos tile is 1/8-inch.

Vinyl

Vinyl-type is the most popular above-grade flooring material used in building construction. Original vinyl tile (early types) showed scuffs and smudges because of the type of "plate finish" or smooth surface that was in use at that time. Embossing or texturing of the finish has helped to conceal wear marks and scratches. By adding carved, pitted fissured, or grained effects, the tile's surface appearance was improved and, at the same time, maintenance was greatly reduced. By adding the embossing we just described, dirt on this new type of tile lies loosely in the recesses instead of being ground into the surface when the tile is walked upon. Vinyl tile is available in thicknesses of 1/16 and 1/8 inch. It is usually 12-by 12-inch square and may be self-sticking. All that is required to lay the self-sticking tile, as you already know, it to peal the protective paper. Cutting vinyl tile is also a lot easier because you can use a pair of household scissors or a sharp pocket knife. Vinyl tile, because of the new surface texture, hides seams, uneven floor surfaces, and dents or impressions made by furniture.

Asphalt

Asphalt tile is the oldest type of synthetic floor tile manufactured. It was and is available (only in some areas of the country) in many colored and marbelized surface finishes. The usual size of asphalt tile is 9 by 9 inches with a standard thickness of 1/8 inch. It is a very durable tile and will last over long periods in areas subject to heavy foot traffic. The principle disadvantage of asphalt tile is the time required for installation.

As with many things, both good and bad, replacement of items eventually happens and this is occurring with asbestos tile. We will cover tile installation shortly, using the adhesive method for applying tile. During the discussion, these methods will apply to laying the 9 by 9 asbestos tile also, with one exception and that is "heat." Asphalt tile needs to be heated during laying, cutting and repairing single tiles. We could use many pages discussing asphalt tile. If you experience any problems you will find someone in your shop who has worked with this tile and will be glad to offer expertise on this subject.

Lineoleum/Sheet Vinyl

Linoleum and sheet vinyl is a resilent floor covering. At one time, the use of these items in construction declined but due to cost, design changes, and methods of application, there is a vast increase in usage of these items today. Ktichens, bathrooms and other areas subject to moisture are recommended areas for using these two products. The primary difference between linoleum and sheet vinyl is the thickness. Linoleum is usually 3/16-inch thick and has a fabric backing. Sheet vinyl is only 1/16-inch but both are applied using the same procedures as for floor tile. These materials are available in rolls of specified length and widths of 6, 9, and 12 feet. As for colors or patterns, one of our reference companies used in developing this material carries 66 different colors and patterns and there are many more. Based upon revival of this product.

CAULKING

Even when the joints between the window and door casings and sills are made carefully and accurately, moisture may still enter. If the back (unpainted) sides of these external finishing boards become wet, the boards will rot, since they dry very slowly. Therefore, caulking compound, which consists of a soft adhesive filler material, must be applied to fill and seal these joints. The joints between the siding and corner boards are often caulked, too.

Caulking Compounds

A suitable caulking compound is composed of pigments (or fillers), a liquid, and mineral fibers. The consistency of the compound depends upon the amount of each part in the mixture. Caulking compounds are available in at least twenty shades and colors, including black, white, and aluminum. There are two grades of commercially recognized caulking compounds; grades 1 and 2. Grade 1 is of soft consistency suitable for application with a caulking gun. Gun application is recommended for general use, since it is easy to apply, is economical, and takes about one-third the time required for knife application. You may use a knife for application where a neat finished appearance for conspicuous location is desired. Grade 1 is available both in bulk containers and in an easy-to-use cartridge (tube form). Grade 2 has the consistency of glazing putty and is usually applied with a knife. It is available in bulk containers.

Caulking Guns

Most caulking guns are hand-operated. (Power guns operated by air pressure also are available and extremely useful when large caulking jobs are undertaken.) The standard hand-operated gun as illustrated in figure 31 consists of a compound reservoir, nozzle, handle, piston, ratchet rod, and trigger mechanism. Gun nozzles are available in many sizes and shapes. Tip openings are furnished for use in level or angled application of the compound. You will save time if you select the proper nozzle for the particular job. Another popular type of hand operated caulking gun, designed only to be used with caulking cartridges, can be seen in figure 32. Its operating features are the same as those of the gun shown in figure 31, except that the top half of the compound reservoir is designed in such a way that a self-contained cartridge can be easily inserted and removed. Also, a fixed nozzle is attached to each cartridge rather than to the caulking gun.

When applying the caulking compound, place the nozzle tip at, or preferably insert it into, the joint to be filled. Apply the caulking compound by a coordinated action of pumping compound with the trigger while moving the tip of the nozzle along the joint.

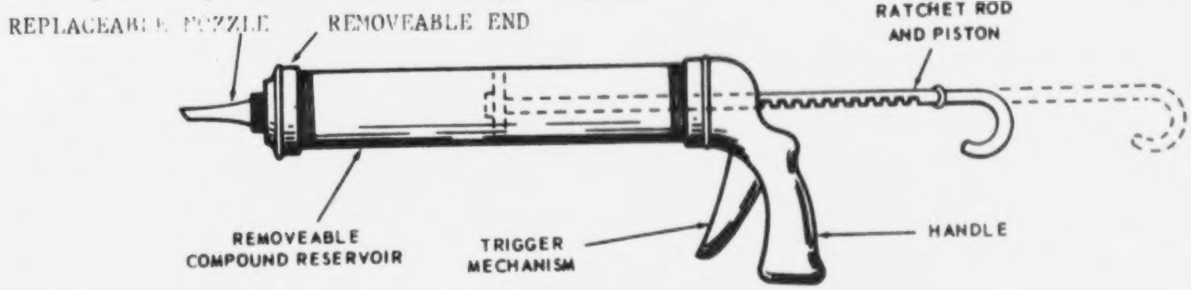
REPLACEABLE NOZZLE
REMOVEABLE END
RATCHET ROD AND PISTON
REMOVEABLE COMPOUND RESERVOIR
TRIGGER MECHANISM
HANDLE

Figure 31. Caulking Gun

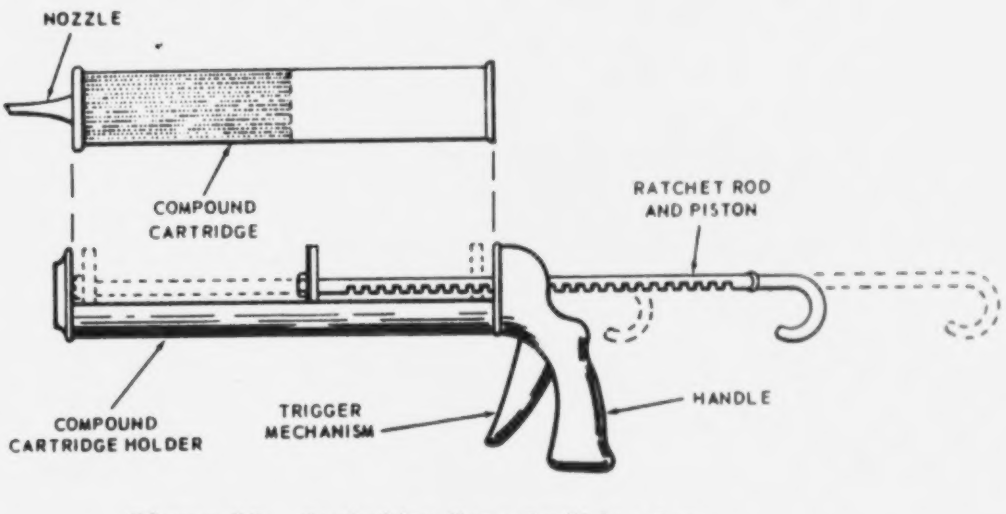
NOZZLE
COMPOUND CARTRIDGE
RATCHET ROD AND PISTON
COMPOUND CARTRIDGE HOLDER
TRIGGER MECHANISM
HANDLE

Figure 32. Cartridge Type Caulking Gun.

PREFAB UNITS

It is often cheaper, and certainly more timesaving, to install units that have been mass-produced than to build cabinets or other items into a building. Let's see how to install these prefabricated units.

Your first step, of course, is to measure the space carefully where the cabinets are to fit. Then order them accordingly. Prefab units are available in a variety of sizes.

Modern prefabricated cabinet work includes kitchen cabinets, storage drawers and shelves, wardrobes, room dividers, and bathroom lavatory cabinets. These prefabricated units are available in a wide range of sizes that can be adapted to various interior arrangements.

Wall Cabinets

Figure 33 illustrates a factory built wall cabinet 36 inches long and 12 1/4 inches deep. It is of the type commonly used in kitchens. Note the hanging strips on the back wall of the cabinet. These are ordinarily 1 x 2-inch reinforcements that run the full length of the cabinet wall. They are strong enough to support the cabinet.

These cabinets are available in various heights, including 15, 18, and 30 inches, and various widths from 34 inches to 84 inches. They can be installed separately or in groupings (side by side).

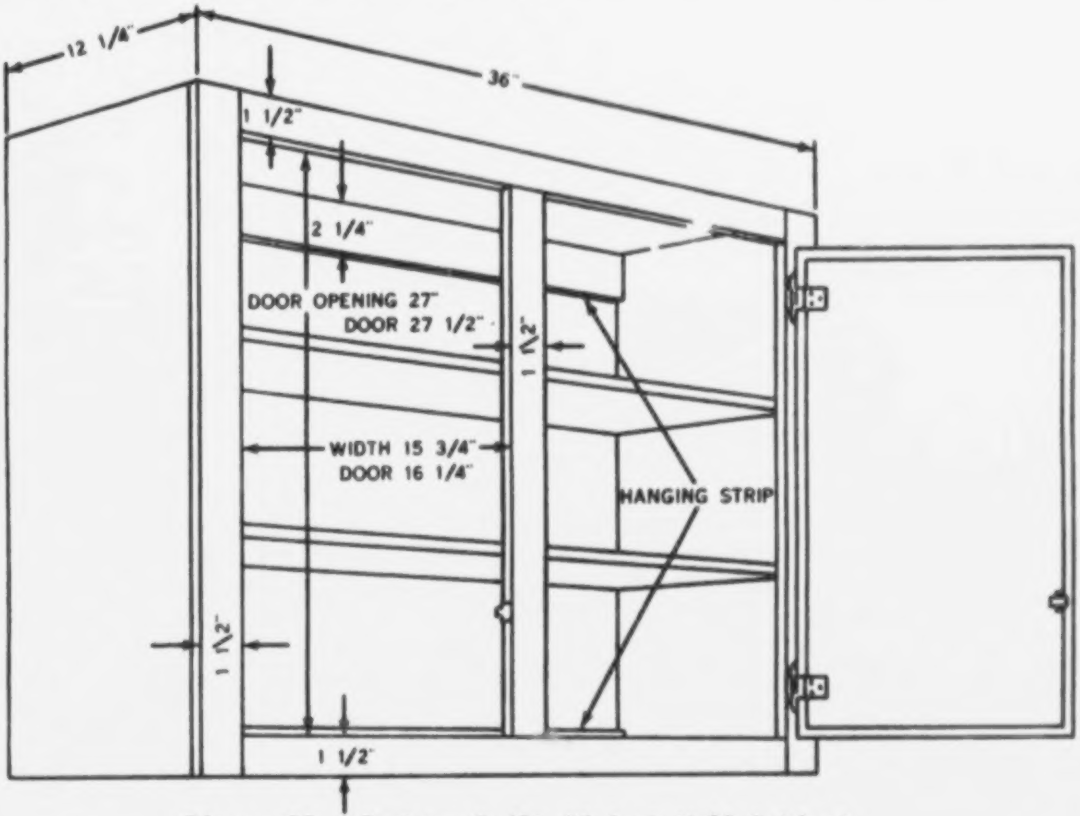

Figure 33. Factory-Built 36-inch Wall Cabinet.

Fasten them to the wall securely, using lag screws, toggle bolts, nails, or power-actuated holding devices. Before you attempt to fasten cabinets to a plaster or gypsum board wall, however, first locate the studs, then drill the hole through the cabinet hanging strip and use screws, lag screws or nails driven into the studs. If the wall is tile, concrete block, or some other hollow wall, you must use toggle bolts to hold the cabinets securely.

Base Cabinets

Figure 34 shows a typical prefabricated base cabinet 36 inches long, 24 inches deep, and 34 1/2 inches high. This is the type of base cabinet commonly used in kitchens. Note the fastening strip on the back of the cabinet. It is built into the cabinet for strength.

These cabinets are available in various lengths from 12 inches through 84 inches. The height and depth, however, normally remain the same. The height of 34 inches, or 34 1/2 inches, is the height of the cabinet minus the top. This allows you to install the type of top your specifications require.

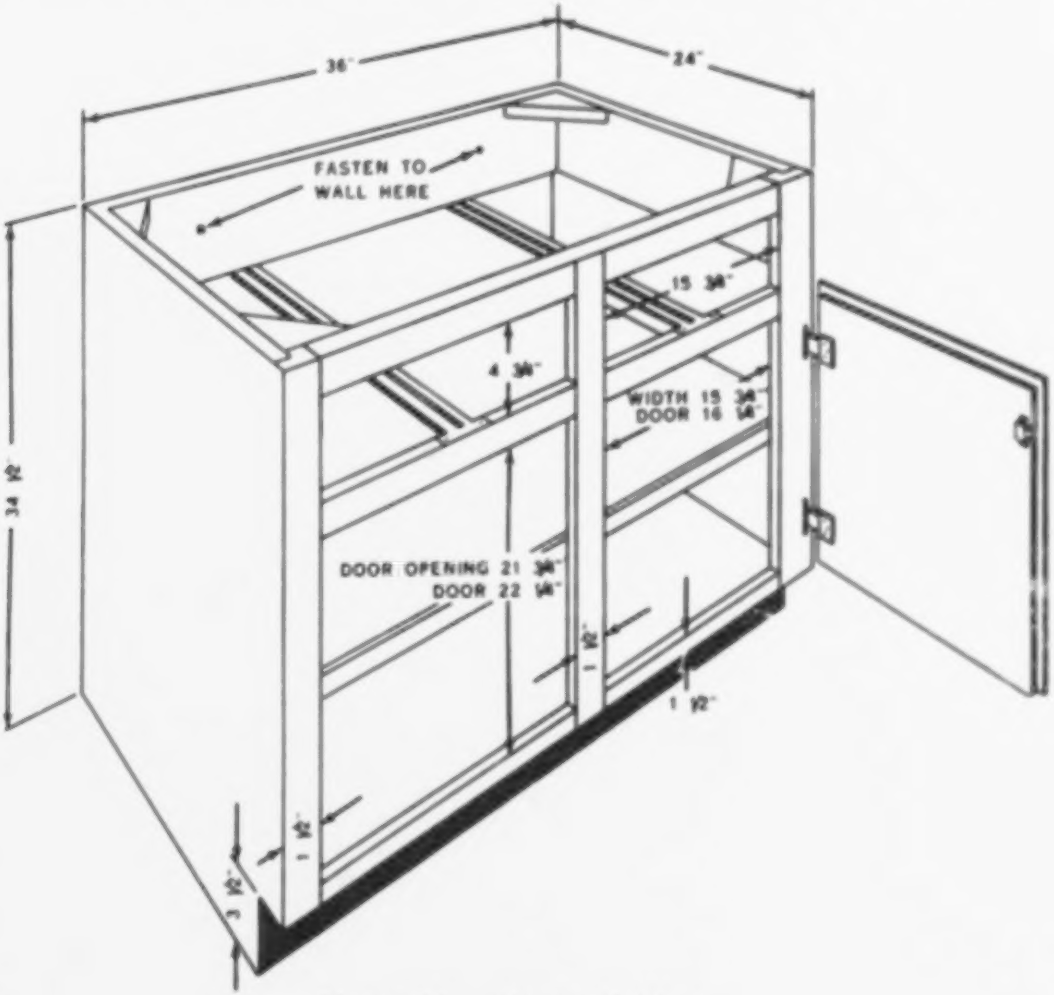

Figure 34. Kitchen Cabinet.

Some base cabinet specifications require tops of ceramic tile, hardwood, stainless steel, laminated plastic, or any of dozens of other treatments. Some of the base cabinets are equipped with drawers, instead of the doors and drawers that are designed for use in corners, and have rotating shelves.

You fasten these base cabinets to the wall in the same manner as you do the wall cabinets. Also, a fastening strip near the bottom of the cabinet should be fastened securely. Try to fasten these cabinets to the studs whenever possible.

Base cabinets do not need to be fastened as securely as does the wall cabinet, because the weight of the unit will help keep it in place.

SUMMARY

Hardwood flooring may be one of three types: strip, plank, or block. Birch, beech, maple, and oak are hardwoods for flooring. Hardwood flooring is installed over subflooring. Blind nailing is used.

Resilient floor coverings, such as asphalt and vinyl tile and linoleum are installed with adhesive. Particle board and plywood are used for subflooring for these floor coverings.

Cabinets may be custom-built on the job, or prefabricated. All prefabricated cabinets are built on the assumption that walls are straight and floors are level. Shims are used to compensate for unlevel floors and crooked walls.

QUESTIONS

Answer the following questions from the textbook, Modern Carpentry. DO NOT WRITE IN THE TEXTBOOK.

1. Unit 15, page 403, questions 1-10.

Answer the following questions from the information provided in the study guide.

1. Match each term of dimensions given in column B with its corresponding descriptive statement found in columnm A. NOTE: Each item in column B may be used once or not at all.

Column A

1. A standard wall cabinet is _________ inches deep.

2. _____ inch reinforcements are installed on the back.

3. A typical base cabinet is ______ inches deep and ______ inches high (minus the top).

4. Base cabinets require ______ wall anchors than do wall cabinets.

Column B

a. More

b. Less

c. 10 1/4

d. 12 1/4

e. 16 1/4

f. 18

g. 24

h. 30

i. 34 1/2

j. 1 x 2

k. 2 x 4

2. For each of the following items, place an X beside the true statement; otherwise, leave it blank.

____ 1. Resilient floor coverings applied over old floors usually require more work to prepare the surface than when installing floor covering on a new construction.

____ 2. Asphalt floor tile is not recommended for basement floors.

____ 3. When felt is applied as an underlayment for a nonwood floor covering the edges where two strips of felt join should be butted together.

____ 4. Plywood underlayment should not be less than 3/8-inch thick.

____ 5. Semirigid asphalt saturated board is not recommended for use as an underlayment when exposed to high humidity.

____ 6. Fiberboard underlayment is made by compressing fibers of wood or other substances into sheets.

3. Place an X beside each of the following items that are correct, otherwise, leave it blank.

____ 1. Vinyl-asbestos tile is manufactured with a "plate finish."

____ 2. Vinyl tiles advantages are: It hides seams and uneven floor surfaces.

____ 3. Asphalt tile is easy to apply and can be cut using household scissors.

____ 4. The surface texture (finish) of vinyl-asbestos tile is less brilliant than vinyl tile.

____ 5. Vinyl-tile is recommended for on, above and below grade construction.

____ 6. Vinyl sheets, which are thicker than linoleum are covered on the backside of the material with fabric.

4. Select correct (C) and incorrect (I) statements.

____ 1. Flat grain softwood is recommended for permanent structures when the cost is a factor.

____ 2. You should select flooring material that has the most vertical grain for use in doorways and other areas subject to excessive traffic.

____ 3. "C" and "D" grades of softwood are used where floors are to be heavily stained or painted.

____ 4. When cutting wood flooring, the term undercut identifies the groove that the manufacturer cuts in the underside of the flooring.

____ 5. Building felt should be placed on the subfloor before wood flooring is installed.

____ 6. The first strip of flooring should be placed approximately 1/2 inch from the wall with the grooved edge toward wall.

____ 7. Wood flooring should never be face-nailed.

____ 8. When securing wood flooring to the subfloor or joists, the nails should be driven at approximate 50° angle.

____ 9. The term "end-matched" indicated that wood flooring is tongue-and grooved at the ends.

____ 10. A damaged piece of finished flooring can be replaced by boring a hole two inches below each end of the damaged area and cutting squarely across the piece.

____ 11. A piece of damaged parquet flooring is removed by working from the center of the tile outward.

WORKBOOK
J3ABR55230 000-V-1 thru 3

TECHNICAL TRAINING

Carpentry Specialist

PREFAB BUILDINGS
AND
BUILDING REPAIR

May 1986

USAF TECHNICAL TRAINING SCHOOL
3770 Technical Training Group
Sheppard Air Force Base, Texas

Designed for ATC Course Use
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This workbook contains the measurement devices designed to ensure that you have mastered the required tasks and knowledges as reflected in the current training standard.

The workbook will be controlled by the instructor at all times and will be used to evaluate your attainment of objectives. Upon completion of each workbook exercise, your response or actions will be graded and annotated as satisfactory (S) or unsatisfactory (U) on the criterion checklist. You must attain a satisfactory grade on all objectives in each instructional unit for the entire block, prior to being administered the end-of-block written test.

This workbook will remain the property of the course and will be destroyed upon satisfactory completion and annotation of objectives in the criterion checklist.

UNDER ON CIRCUMSTANCES will you be allowed to remove this workbook from the classroom and/or training area as applicable unless under the direct supervision of your instructor.

Supersedes WB J3ABR55230-V-1 thru 3, Dec 1985
(Copies of superseded publications may not be used.)

PANELING AND TRIM

COURSE: J3ABR55230-000

PC: V-1a

PROJECT OR TASK: PANELING

OBJECTIVE: Given incomplete statements identify the procedures for installing paneling by completing the statements.

INSTRUCTIONS:

1. This is Progress Check V-1a.

2. You are to work individually and without instructor assistance while completing this progress check.

3. You are to complete this progress check from memory, using no notes or other reference materials.

4. You must provide correct responses to all items on this progress check.

5. Return the completed progress check to your instructor.

6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

7. Your instructor will return the graded progress check to you for review.

8. After reviewing the progress checks return the progress check to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Identify the procedures for installing paneling by completing the following statements.

1. The minimum thickness of paneling that can be applied directly to wall studs is ________________________.

2. The first piece of paneling is installed at the ______________ of the room.

3. When installing paneling, allow approximately _____ inch clearance at tops and bottoms of panels for expansion and contraction.

COURSE: J3ABR55230-000

PC: V-1b

PROJECT OR TASK: INSTALLING PANELING

OBJECTIVE: Given procedures, paneling, tools, materials, equipment and working as a member of a team panel an existing wall with no more than two instructor assists. Paneling must be securely fastened to the wall, plumb, and all joints must be butted.

INSTRUCTIONS:

1. This is Progress Check V-1b.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Two instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill all obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Select a corner to begin paneling.

2. Lay out all work to be done prior to installation.

3. Check corner for square and plumb.

COURSE: J3ABR55230-000

PC: V-1c

PROJECT OR TASK: INSTALLING TRIM

OBJECTIVE: Given tools, materials, equipment and working as a member of a team cut and install trim with no more than two instructor assists. The joints must be tight and smooth.

INSTRUCTIONS:

1. This is Progress Check V-1c.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with the objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Two instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL OBLIGATIONS outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade the performance and completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using tools and materials provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Prepare to install trim at the area specified by your instructor.

2. Cut the following joints:

   (a) Scarf joint
   (b) Outside miter
   (c) Coped joint

3. Nail to plaque with 1" brads.
4. Ensure joints are tight and smooth.

COURSE: J3ABR55230-000

PC: V-2a

PROJECT OR TASK: IDENTIFY PREFAB BUILDINGS

OBJECTIVE: Given incomplete statements, identify the procedures for assembling and erecting prefabricated buildings by completing the statements.

INSTRUCTIONS:

1. This is Progress Check V-2a.

2. You are to work individually and without instructor assistance while completing this progress check.

3. You are to complete this progres check from memory, using no notes or other reference materials.

4. You must provide correct responses to all items on this progress check.

5. Return the completed progress check to your instructor.

6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

7. Your instructor will return the graded progress check to you for review.

8. After reviewing the progress check, return it to your intructor. Progress checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Complete the following statements.

1. The main advantages of prefab buildings are cost, __________ __ __________, mobility and flexibility.

2. The two types of materials used for prefabricated buildings are wood and

________________.

3. The type of prefabricated buildings in which the materials are cut to

size at the factory and assembled at the job site, is called ________________.

4. A base hut is sometimes known as a ____________________ hut.

5. A prefabricated building is erected according to ______________________

______________________.

COURSE: J3ABR55230-000

PC: V-2b

PROJECT OR TASK: ERECT PREFAB BUILDING

OBJECTIVE: Given erection procedures, materials, tools, equipment, foundation and working as a member of a team assemble and erect a prefabricated building with no more than three instructor assists. The erected prefabricated building must be securely fastened and be within ± 1" of plumb and square.

INSTRUCTIONS:

1. This is Progress Check V-2b.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with the objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Three instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using erection procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Ensure foundation is square.
2. Read manufacturers erection procedures.
3. Lay out all work to be done.
4. Install components following manufacturers procedures.
5. Ensure all components are securely fastened.
6. Check building for plumb and square.
7. Have instructor inspect your building.
8. Disassemble prefabricated building.

FLOORING, CAULKING, AND PREFA UNITS

COURSE: J3ABR55230-000

PC: V-3a

PROJECT OR TASK: Identify Flooring and Caulking Procedures

OBJECTIVE: Given incomplete statements, identify procedures for installing, repairing, or replacing flooring, caulking, and prefab units by completing the statements.

INSTRUCTIONS:

1. This is Progress Check V-3a.

2. You are to work individually and without instructor assistance while completing this progress check.

3. You are to complete this progress check from memory, using no notes or other reference materials.

4. You must provide correct responses to all items on this progress check.

5. Return the completed progress check to your instructor.

6. Your instructor will grade the progress check using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

7. Your instructor will return the graded progress check to your for review.

8. After reviewing the progress check, return it to your instructor. Progress checks are CONTROLLED ITEMS.

MISSION I
(KNOWLEDGE)

Complete the following statements.

1. Grain texture and ____________ should match when replacing a strip of wood flooring.

2. The first step in layout for a tile floor is to locate the center of the ____________ walls.

3. When using a caulking gun, it should be held at a ________ degree angle.

4. Nuts, bolts and screws are a part of the package when a prefabricated building is purchased and are known as ___________________________.

5. The best tool to use to clean a wood joint prior to caulking is a ______________ brush.

COURSE: J3ABR55230-000

PC: V-3b

PROJECT OR TASK: Wood Floor Repair

OBJECTIVE: Given procedures, a wooden floor, tools, materials, equipment and working as a member of a team repair a damaged area of flooring with no more than two instructor assists. The repaired area must be securely fastened and match the existing floor.

INSTRUCTIONS:

1. This is Progress Check V-3b.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with the objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Two instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Select replacement piece of flooring that matches existing floor in grain and color.

2. Cut out and remove damaged piece of flooring.

3. Install new wood by removing lower lip of groove.

4. Secure floor by face nail, set and fill.

5. Clean work area.

COURSE: J3ABR55230-000

PC: V-3c

PROJECT OR TASK: Tile Floor Repair

OBJECTIVE: Given procedures, a tiled floor, tools, materials, equipment and working as a member of a team repair a damaged section of flooring with no more than two instructor assists. The repaired area must be securely fastened no buldges, and all joints must be tight.

INSTRUCTIONS:

1. This is Progress Check V-3c.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaniningful tasks associated with the objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Two instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Remove damaged tile with hammer and dull chisel.

2. Fill all cracks or holes with mastic filler.

3. Prime area with appropriate primer.

4. Install tile securely using mastic.

5. Ensure tile has no bulges.

6. Ensure all joinst are tight.

COURSE: J3ABR55230-000

PC: V-3d

PROJECT OR TASK: Install Prefabricated Cabinet or Bookcase

OBJECTIVE: Given procedures, a prefabricated cabinet or bookcase, tools, materials, equipment and working as a member of a team install the cabinet or bookcase with no more than two instructor assists. The installed unit must be securely fastened, plumb and level.

INSTRUCTIONS:

1. This is Progress Check V-3d.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Two instructor assists per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outline in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progress check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Locate studs.
2. Determine type of fastener to be used.
3. Install cabinet or bookcase according to given procedures for screws and/or toggle bolts.
4. Installed unit must be secure.
5. Installed unit must be plumb and level.

COURSE: J3ABR55230-000

PC: V-3e

PROJECT OR TASK: Caulking

OBJECTIVE:

Given procedures, tools, materials, equipment and working as a member of a team caulk windows with no more than two instructor assists. Caulked areas must be overlayed 1/8" and present a smooth and even appearance.

INSTRUCTIONS:

1. This is Progress Check V-3e.

2. Your instructor will assign you to a team for the completion of this Progress Check.

3. As a member of a team, you must work as an ACTIVE TEAM MEMBER. You will be observed while serving at least two meaningful tasks associated with the objective. Observing or reading a maintenance document DOES NOT fulfill this obligation.

4. Two instructor assist per group will be available for this progress check.

5. Your instructor will provide you with all tools and materials needed for completing this progress check.

6. You must fulfill ALL obligations outlined in the instructions to Mission I for this performance evaluation.

7. Your instructor will grade your performance and the completed task using ATC Form 98, Student Progress Checklist, using "S" for satisfactory and "U" for unsatisfactory.

8. Any UNSAFE ACT by a team member could result in personal injury or equipment damage and will result in TEAM FAILURE of this progress check.

9. You are to return the completed progres check to your instructor. Progress Checks are CONTROLLED ITEMS.

MISSION I
(PERFORMANCE)

Using procedures provided and working as a team member, demonstrate proficiency by completing the following exercise:

1. Read manufacturer's instructions on the caulking container.

2. Clean joint to be caulked with wire brush or putty knife.

3. Apply a smooth 1/8" bead filling a simple seam in one stroke.

4. Remove excess caulking leaving a smooth and even appearance.